

# Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

---

Vol. 51.

October, 1949

No. 610

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF  
HARVARD UNIVERSITY—No. CLXX

THE AMERICAN BARBISTYLED SPECIES OF  
TEPHROSIA (LEGUMINOSAE)

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(Continued from page 231)

## SYSTEMATIC TREATMENT

The generic description given below is based on the specimens examined in the course of this study and includes both groups of the New World species. It does not entirely apply to a number of species of the Eastern Hemisphere.

In the treatment of individual species the type-collections or -localities of names are included with the synonymy. Types and isotypes which have been examined are indicated by the herbaria in which they are deposited.

### TEPHROSIA Pers.

*Cracca* L. Sp. Pl. 752. 1753, not Medic. 1789, nor Benth. 1853. Type-species: *C. purpurea* L.

*Colinil* Adans. Fam. 2: 327. 1763. Substitute name.

*Tephrosia* Pers. Syn. Pl. 2: 328. 1807. *Nomen conservandum*. Type-species: *T. villosa* (L.) Pers. not (Michx.) Pers.

*Kiesera* Reinw. Syll. Ratisbonn. 2: 11. 1828. Type-species: *K. sericea* Reinw. (= *Tephrosia candida* DC.).

*Xiphocarpus* C. Presl, Symb. Bot. 1: 13. pl. 7. 1830. Type-species: *X. martinicensis* Presl (= *Tephrosia candida* DC. introduced into Martinique).

*Apodynomene* E. Mey. Comment. Pl. Afr. Austr. 111. 1835. Type-species: *A. grandiflora* (L'Her. ex Ait.) E. Mey. based on *Tephrosia grandiflora* (L'Her. ex Ait.) Pers.



*Balboa* Liebm. (Type-species: *B. diversifolia* Liebm.) and *Crafordia* Raf. (Type-species: *C. bracteata* Raf.) usually assigned to this synonymy are not *Tephrosia*. See EXCLUDED SPECIES.

Erect, decumbent or prostrate perennial herbs or shrubs, usually from a woody crown and heavy woody roots, many species producing rotenone and related compounds. Stems branching either monopodially or sympodially. Pubescence primarily of simple, bicellular hairs 0.1–3 mm. long, these straight, twisted or curling. Minute, flattened 8–10-celled clavate glands of a single layer of cells sometimes present. Leaves 1–41-foliolate, the rachis and sometimes the petioles channeled on the upper side; stipules present, persistent or caducous, usually herbaceous, rarely rigid or spinescent; leaflets petiolulate, estipellate, usually with prominent, nearly parallel veins given off obliquely from the midrib, variously reticulate between; the upper epidermis with or without stomata, glabrous or hairy, the lower surface always with hairs. Inflorescences terminal, axillary or apparently opposite the leaves, in the last actually terminal but overtopped by an axillary branch which may bear a terminal raceme and another axillary branch, a process which may be repeated several times; axillary inflorescences 1–3 from an axil, sometimes obliquely inserted; inflorescences pseudo-racemose, with the flowers in clusters or fascicles at 1 to many nodes, each node with a leaf or primary bract and each of the (2–)3–10 flower-buds with a secondary bract at the base of the pedicel (except in *T. grandiflora*), the bracts persistent or caducous; at least two flower-buds developing and flowering, one or more usually rudimentary; bracteoles on calyx or pedicels usually absent, but present in a few species. Calyx persistent (or circumscissile at the base after anthesis in \**T. sessiliflora*), 5-lobed, the lobes usually unequal, the upper pair more or less united and shortest, the lowermost lobe longest. Petals clawed; blade of the banner more or less orbicular, hairy on the back, often sericeous; the wings lightly coherent with the glabrous keel-petals near the base of the blade; wings and keel-petals with or without a small basal auricle on the upper side; keel usually obtuse, not beaked, or only slightly so. Stamens monadelphous, the filaments connate in a glabrous tube with the vexillary stamen free at the base, or diadelphous with the vexillary stamen completely free; anthers uniform, in two series, unappendaged. Ovary sessile, 4–16-ovulate, surrounded at the base by a collar-like disc within the staminal tube; style glabrous or barbate on the upper (inner) side. Legume sessile, linear, straight or slightly curved, usually compressed, 2-valved, not partitioned between the seeds within, obliquely contracted distally and beaked on the upper side by the persistent style-base; sub-epidermal layer of cells thick-walled and elongate, arranged obliquely, the valves often cracking along these lines at maturity and appearing striate; seeds subglobose to cylindrical or compressed and oblong-reniform in outline, estrophiolate. Somatic chromosomes 22.

DISTRIBUTION. Several hundred species widespread in warm-temperate and tropical regions of both hemispheres, especially in Africa, North America and Australia; absent from Europe.



## ARTIFICIAL KEY TO THE SPECIES

(This key is based primarily on flowering material. For terminology and methods of measurement see MORPHOLOGY AND TAXONOMIC CRITERIA and MEASUREMENTS.)

- A. Style barbate.  
 B. Ovary glabrous on the valves, strigillose along one or both sutures; legume hirtellous to strigillose along the sutures or completely glabrous. . . . . KEY 1  
 B. Ovary pubescent; legume hairy: hirtellous or strigillose to strigose, hirsute, villous or tomentose.  
 C. Vexillary stamen completely free from the staminal tube . . . . . KEY 2  
 C. Vexillary stamen united with the tube but free at the base.  
 D. Staminal tube 18 mm. or more long; keel 21–34 mm. long . . . KEY 3  
 D. Staminal tube 10–15 mm. long; keel 10–19(–20) mm. long.  
 E. Undersurfaces of the leaflets densely tomentose; leaflets large and coriaceous, usually blunt, 1–11; racemes terminal and axillary . . . . . KEY 4  
 E. Undersurfaces of the leaflets variously hairy, but not densely tomentose with tortuous, tangled hairs; leaflets 1–41 . . . KEY 5  
 A. Style glabrous. . . See list of species excluded on this character.

## KEY 1

*Ovary glabrous on the valves, strigillose along one or both sutures; legume hirtellous to strigillose along the sutures or completely glabrous.*

- a. Inflorescences axillary, the lowermost first and best developed; monopodial. . . . b.  
 b. Primary bracts lanceolate to ovate-lanceolate, acuminate, deciduous; leaflets 13–29; rachis 4–11 cm. long; buds and flowers 2 at a node . . . . . 7. *T. cuernavacana*  
 b. Primary bracts linear-subulate to linear-setaceous, sometimes persistent; leaflets 15–37; rachis 4–16 cm. long; buds 5–7 at a node . . . . . 6. *T. Conzattii*  
 a. Inflorescences terminal and axillary or apparently opposite the leaves . . . . c.  
 c. Primary bracts persistent . . . . d.  
 d. Leaves unifoliolate; inflorescences terminal and axillary. . . . . 21. *T. madrensis*  
 d. Leaflets 9–17; plant sympodial, the inflorescences opposite the leaves . . . . . 16. *T. spicata*  
 c. Primary bracts deciduous . . . . e.  
 e. Stipules ovate, acuminate, reddish or brownish, persistent; leaflets 9–15; primary bracts large, broadly ovate, acuminate, inflated, reddish, deciduous; legume 9–16-seeded; Jamaica . . . . . 46. *T. grandiflora*  
 e. Stipules linear-setaceous to linear or lanceolate, green to brownish; leaflets 9–23(–27), linear-oblong to oblong-ob lanceolate or elliptic, strigillose beneath; rachis 2.3–7.2 cm. long; primary bracts linear-setaceous, deciduous; legume 6–11-seeded; Arizona, Sonora, Chihuahua and Jalisco . . . . . 5. *T. leiocarpa*

## KEY 2

*Vexillary stamen completely free from the staminal tube.*

- a. Inflorescences terminal and/or axillary, the latter first and best developed and inserted obliquely in the axils, leafless; leaflets principally 11–21 . . . . b.  
 b. Leaflets linear, 2–6 cm. long, 2–4 mm. wide; calyx 2 mm. long; introduced into Hispaniola . . . . . 49. *T. bracteolata*



- b. Leaflets narrowly elliptic to linear-oblong or elliptic, 1–3.2 cm. long, (3–)4–10 mm. wide; calyx 3.5–6 mm. long; ovules ca. 15; Mexico to Guatemala.....12. *T. rhodantha*
- a. Inflorescences terminal or apparently opposite the leaves or, if axillary, not obliquely inserted....c.
- c. Inflorescences terminating the principal or axillary leafy branches; flower buds 2–3 at a node; bracts usually deciduous; one or more nodes of inflorescence with leaves; leaflets 3–17, uniform, obovate to narrowly cuneate; peninsular Florida.....15. *T. Rugelii*
- c. Inflorescences generally leafless, or occasionally 1 flowering node with a leaf; bracts persistent, except in *T. cana*....d.
- d. Legume hirtellous or strigillose with hairs 0.2–0.5 mm. long; ovary strigillose with minute hairs....e.
- e. Calyx or pedicels with 2 bracteoles; inflorescence congested; calyx densely hairy with white hairs; legume 4–7 cm. long, 4–5 mm. wide, hirtellous; leaflets 7–23; Baja California.....13. *T. cana*
- e. Calyx and pedicels without bracteoles....f.
- f. Leaflets linear to linear-oblong, 9–45 mm. long, 2–7 mm. wide, 5–13, mostly 9 in number; stipules triangular-lanceolate to subulate, rigid; pubescence of plant white, silvery, tightly appressed; Baja California and Sonora.....14. *T. Palmeri*
- f. Leaflets elliptic or elliptic-oblong, elliptic-oblong to lanceolate or cuneate to obovate....g.
- g. Leaves unifoliolate.....21. *T. madrensis*
- g. Leaves (3–)5–19-foliolate....h.
- h. Leaflets 5–11, the upper leaflets of a leaf 3–6 cm. long, 1.3–3 cm. wide, elliptic-oblong to lanceolate, rounded or subcordate at the base, the margins ciliate; flowering nodes 3–18; primary bracts linear-subulate; Sinaloa and Nayarit.....20. *T. tepicana*
- h. Leaflets (3–)5–19, cuneate to obovate, the terminal leaflet 8–35 mm. long, 6–20 mm. wide, or narrowly cuneate to elliptic, 1.8–5.2 cm. long, 2–3 mm. wide; southeastern United States....i.
- i. Stem and leaves prostrate; leaflets primarily 5–7 (rarely 9–11), coriaceous, shining, cuneate to narrowly obovate-cuneate; petioles 1–5(–7) mm. long, 1/3 or less the length of the lowermost leaflet (including petiolule); inflorescences prostrate.....19. *T. chrysophylla*
- i. Stem prostrate, decumbent or erect; leaflets primarily 7–19, if fewer, the terminal more than 30 mm. long; petioles mostly more than 1/3 the length of the lowermost leaflets....j.
- j. Petioles of some or all of the principal leaves 0.3–9.5 cm. long, 1–4 times the length of the lowermost leaflets (including the petiolules), or if less, the stems erect or decumbent; leaflets 7–19.....18. *T. florida*
- j. Petioles of the principal leaves 0.5–1 cm. long, some or all 1/3–7/9(–1) times the length of the lowermost leaflets (including



- the petiolules); stems prostrate; leaves prostrate, ascending or erect; leaflets 7–13, predominantly 9. . . 19a. *T. chrysophylla* × *T. florida*
- d. Legume short-strigose to strigose or hirsutulous to hirsute on the valves; ovary short-strigose to strigose; axis of inflorescence generally not flattened. . . . k.
- k. Leaflets 5–13, mostly 9, linear to linear-oblongate, 9–45 mm. long, 2–7 mm. wide; stipules triangular-lanceolate to subulate, rigid; pubescence of plant white, silvery, tightly appressed; legume 6.5–7 cm. long, 3–4 mm. in diameter, densely strigillose to short-strigose or hirtellous to hirsutulous with white hairs usually less than 0.8 mm. long, 12–16-seeded; Baja California and Sonora. . . . 14. *T. Palmeri*
- k. Leaflets 9–23, not linear or linear-oblongate; pubescence generally partially yellowish or rusty, that of the legume spreading; legume 3–6.5 cm. long, 4.5–6 mm. broad; southeastern United States. . . . l.
- l. Leaflets principally 9–17, oblong-obovate to obovate, elliptic or oblong-elliptic, 11–27 mm. long, 6–13 mm. broad; inflorescences 4–45 cm. long; flowering nodes 2–20; pedicels stout; calyx 6–7 mm. long, the lobes deltoid to lanceolate, long-acuminate, the upper 2.5–5 mm. long, the lateral 3–5 mm. long, the lowermost 4–6 mm. long. . . . 16. *T. spicata*
- l. Leaflets principally 13–19, oblong to ovate-lanceolate or narrowly elliptic, 7–22 mm. long, 2–7 mm. broad; inflorescences 1.5–15 cm. long; flowering nodes 1–3(-5); pedicels almost filiform in flower; calyx 3–4 mm. long, the upper and lateral lobes deltoid, abruptly contracted near the tip, 1.5–2.5 mm. and 1.5–3 mm. long, respectively. . . . 17. *T. hispidula*

## KEY 3

*Staminal tube 18 mm. or more long; keel 21–34 mm. long.*

- a. Leaflets of the principal leaves 3–11. . . . b.
- b. Leaflets 3–7, oblanceolate, principally 2–7.5 cm. long; lateral and lowermost calyx-lobes triangular, subulate, 6–7 mm. long; Sinaloa. . . . 30. *T. hypoleuca*
- b. Leaflets 7–11, narrowly elliptic-oblong or occasionally lanceolate-oblong, 3–7.3 cm. long; calyx 14–16 mm. long, densely villous, the upper lobes 3–8 mm. long, the lateral and lowermost lanceolate or ovate-lanceolate, acuminate, 10–12 mm. long and 11–13 mm. long, respectively; keel 32–34 mm. long, staminal tube 25–27 mm. long; Guerrero. . . . 41. *T. Abbottiae*
- a. Leaflets of the principal leaves 11–31. . . . c.
- c. Upper lobes of calyx almost completely fused, nearly obsolete or rounded, blunt, 0.5–1 mm. long, the lateral lobes rounded-ovate to oblong; introduced species. . . . d.
- d. Primary bracts oval, acuminate, deciduous; legume 10–12 cm. long, 13 mm. wide. . . . 48. *T. Vogelii*
- d. Primary bracts subulate, deciduous; legume 6–9 cm. long, 7–9 mm. wide. . . . 47. *T. candida*
- c. Upper lobes of calyx triangular or acuminate, 1.5–2.5 mm. long, the lateral lobes lanceolate-acuminate to lanceolate-subulate or ovate, short-acuminate; indigenous species. . . . e.
- e. Leaflets 13–31, thin, dull; buds 3–5 at a node; pedicels 8–11 mm. long, slender; claw of keel 5.5–6 mm. long; pods scimitar-shaped, drooping, 5–6.5 cm. long, 4.5 mm. wide, hirtellous. . . . 3. *T. macrantha*



- e. Leaflets 11-17, somewhat coriaceous, shining; buds 5-8 at a node; pedicels 5-8 mm. long; claw of the keel 4 mm. long; legumes 7-10 cm. long, 5-7 mm. wide, hirsutulous.  
 .....28. *T. submontana*

## KEY 4

*Undersurfaces of the leaflets densely tomentose; leaflets large and coriaceous, usually blunt, 1-11; racemes terminal and axillary; Sierra Madre of Mexico from Sinaloa to Guerrero.*

- a. Calyx 5-7 mm. long; primary bracts narrowly deltoid to linear-lanceolate, 1-2 mm. broad....b.  
 b. Leaflets 3-5; lateral calyx-lobes deltoid to deltoid-lanceolate, acuminate, 2.5-4 mm. long; legume 4-4.5 mm. long, densely hirsutulous with nearly straight, crowded, erect, lustrous hairs.....43. *T. major*  
 b. Leaflets 7-11; lateral calyx-lobes ovate to ovate-lanceolate, 4-5 mm. long; legume 4-6.5 cm. long, densely tomentose with tortuous and intertwined hairs.....42. *T. pachypoda*  
 a. Calyx 10-17 mm. long; primary bracts ovate or oval to orbicular, 4-8 mm. broad....c.  
 c. Leaflets 1-3; calyx without bracteoles; bracts deciduous; claw of the keel-petals 4.5 mm. long.....45. *T. platyphylla*  
 c. Leaflets 1-5; calyx with 2 conspicuous oval inflated deciduous bracteoles; claw of the keel-petals 7 mm. long.  
 .....44. *T. diversifolia*

## KEY 5

*Undersurfaces of the leaflets variously hairy, but not densely tomentose with tortuous, tangled hairs; leaflets 1-41.*

- a. Flower-buds 2 (or rarely 3) at a node, usually only 2 flowering; inflorescences more or less compact, anthesis proceeding centrifugally, both flowers of a pair in anthesis together; bracts deciduous; stems usually erect; leaflets thin, stomatiferous on both surfaces....b.  
 b. Primary bracts lanceolate, 2-3 mm. broad, acuminate, the base acute; pubescence of stems upwardly directed; pubescence of legume rusty or tawny, at least along the margins; Chihuahua to Guanajuato and Querétaro....8. *T. leucantha*  
 b. Primary bracts linear to linear-lanceolate, acuminate, rarely more than 1.2 mm. wide....c.  
 c. Stems and axis of inflorescence doubly pubescent, both hirtellous with fine, strongly retrorse hairs and hirsutulous with downward- and outward-curving hairs; corolla white, becoming purplish; pubescence of legume rusty; Arizona, Sonora and Chihuahua.....9. *T. Thurberi*  
 c. Stems and axis of inflorescence with antrorse or spreading hairs; corolla usually bicolored, the banner yellow, the wings and keel rose (rarely white); pubescence of legume white or cinereous; central United States, eastward.....10. *T. virginiana*  
 a. Flower-buds 3-5 or more at a node, 3 or more flowering; anthesis usually irregular; racemes more or less elongate (except in *T. vernicosa*)....d.  
 d. Leaflets principally 2-6 mm. wide (rarely 8 mm.); low, decumbent or erect plants with 9-25 leaflets, strigillose to densely strigose or hirsutulous beneath....e.  
 e. Inflorescences terminal or axillary, the latter not emerging obliquely from the axils....f.  
 f. Calyx 4-5.5 mm. long, strigillose; calyx-lobes deltoid



- to deltoid-ovate, rather abruptly acuminate, the lateral lobes 2.5–3 mm. long . . . . . 24. *T. saxicola*
- f. Calyx 6–10 mm. long; lateral and lowermost calyx-lobes narrowly triangular-subulate to lanceolate, long-acuminate, 4–7 mm. long; leaflets densely strigose to hirsutulous beneath . . . . . g.
- g. Parallel lateral veins of leaflets prominent, the veinlets forming elongate areoles between them; upper epidermis of leaflets with stomata; Oaxaca . . . . . 26. *T. Pringlei*
- g. Parallel lateral veins of leaflets obscure, the veinlets between them forming nearly isodiametric areoles; upper epidermis lacking stomata; Sinaloa and Nayarit . . . . . 25. *T. Seemannii*
- e. Inflorescences primarily axillary or some terminal, the axillary inflorescences emerging singly and obliquely from the axils of leaves . . . . . h.
- h. Leaflets linear, 2–6 cm. long, 2–4 mm. wide; calyx 2 mm. long; introduced species, Hispaniola . . . . . 49. *T. bracteolata*
- h. Leaflets narrowly elliptic to linear-oblong or elliptic, 1–3.2 cm. long, (3–)4–10 mm. wide; calyx 3.5–6 mm. long; Sinaloa to Guatemala . . . . . 12. *T. rhodantha*
- d. All or most of the principal leaflets 8 mm. or more wide (rarely 6 mm. wide) . . . . . i.
- i. Inflorescences axillary only or, if both terminal and axillary, the latter first and best developed, terminating leafy or naked branches . . . . . j.
- j. Leaflets 5–9, large, coriaceous, the areoles between the principal lateral veins isodiametric or nearly so, the upper epidermis estomatiferous . . . . . k.
- k. Inflorescences lax, often spreading and somewhat recurved, calyx 4–5 mm. long, hirtellous or strigillose, the lobes deltoid, abruptly subulate, the lateral lobes 1.5–3 mm. long; Sinaloa to Guerrero . . . . . 39. *T. crassifolia*
- k. Inflorescences crowded, ascending; calyx 6–9 mm. long, densely hirsutulous, the lateral lobes lance-subulate, attenuate, 4.5–6 mm. long; Veracruz to Guatemala . . . . . 40. *T. lanata*
- j. Leaflets 11–37, membranous, the areoles between the principal lateral veins usually distinctly elongate, the upper epidermis stomatiferous . . . . . l.
- l. Leaflets 11–21; ovules ca. 15; seeds 12–15; legume usually hirtellous . . . . . 12. *T. rhodantha*
- l. Leaflets 15–37, predominantly 21–35; ovules and seeds 8–10; legume usually hirsutulous . . . . . 1. *T. multifolia*
- i. Inflorescences terminal, both terminal and axillary or apparently opposite the leaves, not exclusively axillary or singly and obliquely inserted in the axils . . . . . m.
- m. Principal leaflets obovate to broadly obovate-cuneate or orbicular, occasionally elliptic; decumbent herbs, branching sympodially; legume 4–5 cm. long, 7–8.5 mm. wide; ovules 4–8; seeds 4–8, tan or stramineous, unmarked . . . . . n.
- n. Leaflets 5–19, primarily 9–11, densely hirsutulous to nearly glabrous above, but with at least a few appressed hairs near the margins, the margins conspicuously bordered with white hairs; calyx and back of banner with whitish hairs; ovules and seeds 5–6 . . . . . 22. *T. Lindheimeri*



- n. Leaflets 3-9, primarily 5-7, completely glabrous above, the margins not conspicuously bordered; indument of calyx and banner golden; ovules and seeds 4-8. . . . . 23. *T. potosina*
- m. Leaflets not as above; branching monopodial or sympodial; legume (where known) 3.5-6.5 mm. wide (or -7 mm. in *T. Langlassei*). . . . . o.
- o. Leaflets 15-41 (except *T. belizensis* 5-19, *T. onobrychoides* 13-29 and *T. nicaraguensis* 9-21); upper lobes of calyx 1-3.5 mm. long, the lateral 1.5-4 mm. long. . . . . p.
- p. Calyx 5.5-8.5 mm. long, the lateral lobes oblong to obovate, abruptly and usually obliquely short-acuminate, 2.5-4 mm. long, the lowermost lobes lanceolate-ovate to ovate or obovate, 3.5-5 mm. long, 2-4 mm. broad; leaflets 17-41; ovules 10-13; Mexico to Brazil, Bolivia and Peru. . . . . 4. *T. Sinapou*
- p. Calyx 3.5-7 mm. long, the lateral and lowermost lobes deltoid, lanceolate, or linear-lanceolate, acuminate or subulate, not obliquely so. . . . . q.
- q. Upper leaflets of a leaf lanceolate or ovate-lanceolate, 2-7.5 cm. long, glabrous and lacking stomata above, moderately to densely strigillose or short-strigose and silky beneath; Veracruz, Oaxaca, Chiapas, Br. Honduras. . . . . 33. *T. belizensis*
- q. Upper leaflets of a leaf linear-oblong, oblong-lanceolate, oblong, elliptic or linear-oblongate, obtuse, rounded or cuneate at the base; upper epidermis with stomata (except *T. nicaraguensis*). . . . . r.
- r. Ovary and legume strigillose or hirtellous. . . . . s.
- s. Slender monopodial shrub 2 m. high; leaflets 15-31, oblong to linear-oblong, the base obtuse or somewhat cuneate; vexillary stamen with a 2-lobed callosity on the upper surface near the base; legume curved upward near the distal end; calyx strigillose with cinereous hairs; Sinaloa and Durango. . . . . 2. *T. foliolosa*
- s. Erect or decumbent herb, monopodial or sympodial, to 1 m. high; leaflets principally 13-25(-29), linear-oblongate or narrowly elliptic to oblong-elliptic or elliptic-cuneate; vexillary stamen flat on the upper surface; legume straight or curved downward distally; calyx doubly pubescent, both hirtellous and hirsutulous or hirsute; south-central United States. . . . . 11. *T. onobrychoides*
- r. Ovary and legume hirsutulous; calyx doubly pubescent. . . . . t.
- t. Leaflets 9-21, narrowly oblong to oblong to elliptic, the base obtuse or rounded, the areoles between the principal lateral veins nearly isodiametric; legumes spreading, straight or curved downward; ovules and seeds 4-8; erect monopodial herb or sub-



- shrub 2-5 dm. high; Chihuahua to Nicaragua . . . . . 27. *T. nicaraguensis*
- t. Leaflets 15-37, linear-oblong, oblanceolate or occasionally elliptic, the base obtuse to rounded; legumes usually drooping, the distal half somewhat curved upward; ovules and seeds 8-10; erect, monopodial herb or shrub 1-2 m. high; Chihuahua to Panama . . . . . 1. *T. multifolia*
- o. Leaflets 1-13 (except *T. belizensis* 5-19, *T. onobrychoides* 13-29 and *T. nicaraguensis* 9-21) . . . . u.
- u. Leaves unifoliolate (or on large plants 1-7 foliolate); ovules 6-7 . . . . v.
- v. Leaflets densely hairy beneath, silvery or silky; calyx 6.5-9.5 mm. long, the lateral lobes 4-7 mm. long; leaflets 1-7 . . . . . 38. *T. Watsoniana*
- v. Leaflets sparsely strigillose beneath; calyx 3.5-5 mm. long, the lateral lobes 1.5-3 mm. long; leaves unifoliolate . . . . . 21. *T. madrensis*
- u. Leaves 5-13-foliolate (except as noted in (o.) above) . . . . w.
- w. Calyx 4-7 mm. long, strigillose or hirtellous to short-strigose or hirsutulous, the upper lobes 1-4 mm. long . . . . x.
- x. Ovules 4-8; bracts 5-8 mm. long (or -14 mm. in *T. nicaraguensis*); apex of leaflets acute, obtuse or rounded; leaflets hairy above; legumes hirsutulous to hirsute . . . . y.
- y. Leaflets 9-21; primary bracts persistent . . . . . 27. *T. nicaraguensis*
- y. Leaflets 5-13; primary bracts usually deciduous . . . . z.
- z. Leaflets 7-13, membranous, silky-strigillose beneath; pedicels 5-7 mm. long; upper calyx-lobes 1-2 mm. long . . . . 34. *T. mexicana*
- z. Leaflets 5-11, thin but rigid, somewhat coriaceous, hirsutulous and pilose beneath; pedicels 7-14 mm. long; upper calyx-lobes 3-4 mm. long . . . . . 36. *T. simulans*
- x. Ovules 9-11; bracts persistent or deciduous; legumes hirtellous (or in *T. belizensis* sometimes hirsutulous) . . . . aa.
- aa. Calyx-lobes linear-lanceolate to lanceolate; leaflets 5-19, the upper pairs lanceolate or ovate-lanceolate, glabrous and estomatiferous above, strigillose or short-strigose and silky below; bracts deciduous . . . . . 33. *T. belizensis*
- aa. Calyx-lobes deltoid or deltoid-ovate . . . . bb.
- bb. Leaflets (11-)13-25(-29); axis of inflorescence not flattened; bracts often deciduous, 5-12 mm. long; staminal tube 14-15 mm. long; legume 4.5-5 mm. wide . . . . . 11. *T. onobrychoides*
- bb. Leaflets 5-11; axis of inflorescence usually flattened, 2-edged; primary bracts 3-9 mm. long, persistent; stam-



- inal tube 9–10 mm. long; legume 6 mm. wide . . . . . 20. *T. tepicana*
- w.* Calyx 8–12 mm. long, the upper lobes 4.5–7 mm. long . . . . . *cc.*
- cc.* Primary bracts persistent, 7–18 mm. long; leaflets lanceolate to ovate-lanceolate, elliptic-lanceolate or oblong-lanceolate, the apex acuminate or occasionally acute; calyx hirtellous and hirsute or villous with golden or rusty hairs; ovules 6–7; legume 6–7 mm. broad, hirsutulous to hirsute. . . . . 35. *T. Langlassei*
- cc.* Primary bracts deciduous, 6–11 mm. long . . . . . *dd.*
- dd.* Calyx or pedicels with 1–2 narrow bracteoles; leaflets evenly hirtellous or hirsutulous above, hirsutulous below with cinereous hairs . . . . . 32. *T. pogonocalyx*
- dd.* Calyx and pedicels without bracteoles; leaflets shining, glabrous or strigillose along the midrib above, strigillose to short-strigose below . . . . . *ee.*
- ee.* Leaflets 5–9, narrowly lanceolate, tapering to both ends, or oblanceolate; inflorescences 2–3 cm. long, compact, subcapitate, the nodes crowded; ovules 6–7 . . . . . 31. *T. vernicosa*
- ee.* Leaflets (5–)7–13, oblong, oblong-oblanceolate or linear-oblong; inflorescences 6–27 cm. long, slender; ovules 9–10 . . . . . 37. *T. quercetorum*

### 1. *Tephrosia multifolia* Rose

*Tephrosia multifolia* Rose, Contr. U. S. Nat. Herb. **1**: 320. 1895. "Creek bottom, Manzanillo," Colima, Mexico, *E. Palmer 1364*, 2–18 Mar. 1891 (US 208929-Type; GH, NY, UC, US).

*Cracca multifolia* Rose, Contr. U. S. Nat. Herb. **12**: 270. 1909.

*Cracca arcuata* Rydb. N. Amer. Fl. **24**: 166. 1923. Maria Madre Island, Tres Marias Islands, Nayarit, Mexico, *E. W. Nelson 4193*, 3–25 May 1897 (US 345936-Type; GH).

*Tephrosia arcuata* (Rydb.) Standl. Field Mus. Publ. Bot. **4**: 213. 1929.

*Cracca Heydeana* Rydb. N. Amer. Fl. **24**: 166. 1923. Cerro Redondo, Dept. Santa Rosa, Guatemala, *Heyde & Lux*, Oct. 1893 (J. D. Smith Distrib. No. 6111) (NY-Type; GH, US).

*Tephrosia Heydeana* (Rydb.) Standl. Jour. Wash. Acad. Sci. **17**: 167. 1927.

Erect, much-branched perennial herb or shrub, 1–2 m. high, from heavy woody roots. Stems petioles, rachises and axes of inflorescences hirsutulous, often densely so, with upwardly directed to recurved, rusty to cinereous hairs, velvety. Leaves spreading, 9–34 cm. long, the petioles (6–)10–28 mm. long, shorter than the lowermost leaflets, the rachis (5–)8.5–27 cm. long; stipules linear, acuminate, 8–18 mm. long, about 1 mm. wide, usually deciduous; leaflets of the principal leaves 15–37, predominantly 21–35, linear-oblong, oblong, oblong-lanceolate or occasionally



elliptic, the base obtuse to rounded, the apex obtuse, rounded or retuse, mucronate, (14–)20–65 mm. long, (4–)6–14 mm. wide, 3–6 times as long as broad, those near the middle of the leaf usually longest, the terminal leaflet often somewhat shorter than the others; leaflets thin, pale below, pubescent on both surfaces, sparsely to densely velvety-hirsutulous above with soft, fine cinereous hairs, moderately hirsutulous to hirsute or strigose below with cinereous or, along the midrib, rusty hairs; petiolules 1.5–2.5 mm. long, densely hirsutulous. Inflorescences terminal and axillary, the latter usually first and best developed, (3–)4–29 cm. long, leafless or very rarely with a single leaf, the peduncle (1.5–)2–9(–12) cm. long; flowering nodes (5–)10–ca. 50; buds 5–7 at a node, ca. 5 flowering, 2 or 3 fruiting. Primary bracts linear, acute or acuminate, 7–10 mm. long, 1 mm. or less wide, 3-veined, usually persistent, although often broken in herbarium-specimens; secondary bracts linear-filiform, ca. 4 mm. long, deciduous. Pedicels slender, 5–8(–9) mm. long, bending somewhat in fruit. Dried flowers (12–)14–17 mm. long. Pedicels and calyces doubly pubescent, hirtellous and sparsely to densely hirsutulous with ascending or spreading rusty hairs. Calyx 3.5–6(–7) mm. long, the upper lobes acuminate, 1–2 mm. long, the lateral and lowermost lance-subulate to narrowly triangular, acuminate, 1.5–4 mm. long and (2–)3–4.5 mm. long, respectively. Corolla apparently white, becoming yellowish or purplish with age and yellow to purple or brown when dry; blade of the banner obovate, oval or suborbicular, 13–15 mm. high, 9.5–13 mm. broad, densely covered with fine silky, pale to rusty hairs on the back, the claw 2–3.5 mm. long; wings 13–17 mm. long, 3–4.5 mm. wide, with a claw 2–3 mm. long; keel 13–17.5 mm. long, shallow, exauriculate, the claw 3–3.5 mm. long. Staminal tube 9–14 mm. long, the vexillary stamen coherent with the tube, free at the base, either flat or with an angular thickening on the upper side near the base. Ovary silky, densely appressed-hirsutulous, 8–10-ovulate. Legume generally with the distal half somewhat upcurved, 4.5–6 cm. long, 4–5 mm. wide, usually drooping, velvety, densely hirsutulous with fine erect or ascending cinereous to tawny hairs; seeds 8–10, brown to gray, variegated with black, (3.2–)3.8–4.8 mm. long, 2–2.6 mm. wide. Somatic chromosomes 22.

**DISTRIBUTION.** Primarily at low altitudes (0–1400 m.) from Chihuahua (?) and Sinaloa to Oaxaca and Veracruz to Chiapas, in Mexico, and southward to Panama. Map 1.

**SPECIMENS EXAMINED.** MEXICO. Without locality, *Sessé, Mociño, Castillo & Maldonado 3730* (part), 1787–1795–1804 (F). CHIHUAHUA: Rocky oak slope, Guasaremos, Río Mayo, *Gentry 2463* (A, F, MEXU, MO, UC, US). SINALOA: Without locality, *Ortega 4859* (US), *Ortega 7170* (CAS, F); steep, moist canyon slope with mixed dominants, pine forest area, 6–7000 ft., Ocurahui, Sierra Surotato, *Gentry 6319* (GH, PH) (for map, see *Gentry 1946*); Escuinapa, *Ortega 5172* (US); Estero de Escuinapa, *Ortega 6135* (CAS, US); El Habal, Cacalotan, Rosario, *Ortega 1036* (MEXU). NAYARIT: Maria Madre, Tres Marias Ids., *Nelson 4193* (GH, PH, US), *Maltby 113* (US), *Solis 28* (MEXU); Arroyo



Honda, Maria Madre, *Mason 1761* (CAS, US); vicinity of Acaponeta, *Rose, Standley & Russell 14227* (GH, NY, US); Acaponeta, *Lamb 521* (GH, MO, NY, DS, US), *M. E. Jones 23021* (F, NY, UC); San Blas and vicinity, *W. G. Wright 1337* (DS, F, GH, MO, UC); Mexcaltitán, Municipalidad Santiago Ixcuintla, *Ortega 6135* (DS, GH, PH, UC). JALISCO: Roadside between Las Palmas and Ixtapa, 100–400 ft., *Nelson 4137* (GH, US); open spaces in woods on steep hill, south of Puerto Vallarta, 50 m., *Mexia 1113* (A, CAS, GH, UC, US). COLIMA: Manzanillo, *Palmer 1364*, 1891 (GH, NY, UC, US). MICHOACÁN: Woods, Ostula, Dist. Coalcomán, *Hinton 16180* (US). OAXACA: Jamiltepec, *Conzatti 4400* (NY, US). VERACRUZ: Low bush in the bed of the Caloboyo near Wartenberg (near Tantoyuca), Huasteca, *Ervendberg 307*, 1858 (GH, K, PH). CHIAPAS: Escuintla, *Matuda 17* (A, MO, NY, US); Tres Hermanos, *Juzepozuk 1385* (F); outskirts of Mapastepec, *Hernandez X. & Sharp X-175* (GH).

BRITISH HONDURAS. Secondary forest, Temash River, 100 ft., *Schipp 1340* (A, F, GH, MO, NY); Columbia Forest Camp, *Oliphant*, 1929 (F, K, NY).

GUATEMALA. Without locality, *Owen 13* (US). IZABAL: Cultivated as fish poison, Jocoló, *Johnson 1187* (US). JUTIAPA: Wet thicket near El Molino (Dept. Santa Rosa), 600 m., *Standley 77561* (F); grassy slope between Jutiapa and La Calera, s.e. of Jutiapa, 850 m., *Standley 76062* (F); Jutiapa, *J. R. Johnston 1481*, 1938 (F). SANTA ROSA: Cerro Redondo, 4500 ft., *Heyde & Lux*, 1893 (GH, NY, US); Cuajiniquilapa, 2500 ft., *Heyde & Lux*, 1893 (GH, MO, NY, US); Teocinte, 2500 ft., *Heyde & Lux*, 1892 (GH, US); near Los Verdes, *Standley 60403* (F); along road s.e. of Barberena, 1100–1180 m., *Standley 77733* (F); wet thicket, La Joya de Limón, east of Culiapa, 900 m., *Standley 77945* (F); Oratorio, 1200 m., *Standley 60674* (F).

HONDURAS. Pine and oak region, Mont. de la Flor, Tegucigalpa, *C. & W. von Hagen 1236* (NY).

NICARAGUA. Masaya, *C. Baker 196* (CAS, DS, GH, NY, UC), 793 (US), 23 (GH, NY), 692 (US).

EL SALVADOR. Without locality, *Renson 41* (NY, US), 91 (NY, US). AHUACHAPÁN: *Padilla 279* (NY, US). SANTA ANA: Dry open hillside, Santa Ana, 655–900 m., *Standley 20432* (US). SAN SALVADOR: San Salvador, *Calderón 134* (F); cultivated from seeds from Oriente, Dept. Usulután, *Calderón 8* (F); San Salvador, *Calderón 133* (GH, US), *Velasco*, 1906 (F, US); roadside, San Salvador, 650–850 m., *Standley 19113* (GH, NY, US), *Standley 19646* (GH, US); bank of quebrada, San Salvador, *Standley 20463* (GH, US); brushy slope, San Salvador, *Standley 23148* (US); road from San Martín to Laguna de Ilopango, *Standley 22555* (GH, NY, US). SAN VICENTE: Brushy slope, vicinity of San Vicente, 350–500 m., *Standley 21626* (GH, US).

COSTA RICA. Río Jesus de San Ramón, Alajuela, *Brenes*, 1932 (F); Río Jesús & Picacho del Mondongo de San Ramón, *Brenes*, 1937 (F); "Alto de la Calera," San Ramón, *Brenes 5872*, 1927 (A, F), Jan. 1936 (F),



Jan. 1934 (F); El Paraiso, *Archer 3746* (US); vicinity of Buenos Aires, Puntarenas, *Pittier 3821* (US), *Tonduz 4986* (US); thickets of the Río Ceibo, Buenos Aires, *Conduz 4985* (US); Ujarras de Buenos Aires, *Pittier 10634* (US); Buenos Aires-Osa, *Valerio 919* (F); thickets at Nicoya, *Tonduz 13557* (GH, US); Surubus, *Biolley 7032* (US); Río Nandayuri-Colonia Carmona (Guauac), 100 m., *Jiminez, 1912* (US).

PANAMA. CHIRIQUÍ: Boqueli, Boqueli Dist., *Davidson 591* (A, F, US); between Hato del Jobo and Cerro Vaca, 700–1000 m., *Pittier 5419* (GH, NY, US). CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5125* (US).

The not inconsiderable number of specimens of this species now available for study fails to show any constant characters for the separation of the three species maintained by Rydberg (1923). All of these plants seem instead to belong to a single, somewhat variable species distributed primarily at low altitudes from Sinaloa and perhaps southwestern Chihuahua, in the west, and Veracruz, in the east of Mexico, southward to Panama. The shrubby habit, numerous thin leaflets, predominantly axillary inflorescences, medium-sized flowers, lance-subulate to narrowly triangular, acuminate calyx-lobes with a double indument, and 8–10-seeded, usually drooping pods are characteristic. The variations in flower-size, leaflet-number, etc. cited by Rydberg do not stand up under examination as either specific or varietal characters. In this connection it should be noted that flower- and calyx-size are often variable in this species, the first flowers at a node being somewhat larger than the last. On a single specimen the length of the calyx may vary from 4–5.5 mm. and that of each of the lobes by a full millimeter.

Several more or less peculiar collections indicate the need for more and better specimens and particularly for observations on such items as habit and position of the inflorescences. The Gentry collections from Chihuahua and Sinaloa are aberrant in appearance with a tendency for “paniculate” inflorescences in which a terminal inflorescence bears lateral branches from the axils of bracts. The altitude is also a very suspicious matter at this latitude, since this species occurs primarily at low levels. The racemes and pods of *Palmer 155* (1895) from Acapulco, Guerrero, are unusually long (to 40 cm. and 7 cm., respectively) and the lowermost calyx-lobe tends to be about 1 mm. longer than in most specimens. A similar collection from Acapulco,



*Beechey*, 1842, is at Kew. The single seed-bearing Panamanian collection, *Piper* 5125, has unusually small seeds, only 3.2 mm. long and 2 mm. wide.

*Tephrosia multifolia* appears to be widely grown as a fish-poisoning plant in Central America, where it is known as *barbasco*. The plant undoubtedly contains rotenone and related compounds, but confusion has existed between this plant, "*T. toxicaria*" (= *T. Sinapou*) and "*T. Schiedeana*" (= *T. Sinapou*), so that it is impossible to decipher any of the reported analyses or to determine with certainty the identity of the species mentioned in most anthropological works applying to Central America.

## 2. *Tephrosia foliolosa* (Rydb.) Riley

*Cracca foliolosa* Rydb. N. Amer. Fl. **24**: 162. 1923. Cerro Colorado, vicinity of Culiacán [east of Culiacán], Sinaloa, Mexico, *T. S. Brandegee*, 3 Nov. 1904 (US 572117-Type; GH, POM, UC).

*Tephrosia foliolosa* (Rydb.) Riley, Kew Bull. **1923**: 339. 1923.

Slender shrub about 2 m. high, the base and roots unknown, the stems angled. Stems, petioles, rachises, petiolules and axes of the inflorescences strigillose with cinereous hairs. Leaves 7–18 cm. long, ascending or spreading, the petiole 9–22 mm. long, shorter than the lowermost leaflets, the rachis 5–15 cm. long; stipules subulate or linear-setaceous, 8–10 mm. long, about 0.5 mm. wide, apparently deciduous; leaflets of the principal leaves 15–31, oblong to linear-oblong, the base obtuse or somewhat cuneate, the apex obtuse, rounded or emarginate, mucronate, (15–)20–45 mm. long, (3–)5–11 mm. wide, 3.5–6 times as long as broad, thin, pale beneath, thinly but evenly strigillose above, strigillose below with cinereous hairs, the veins conspicuous. Inflorescences terminal and axillary (sometimes 2 from 1 axil), leafless, ascending, 5–20 cm. long, the peduncle 0.5–4.5 cm. long, the flowering nodes 5–20, buttressed below; buds 5–7 at a node, ca. 5 of these flowering, 1–3 fruiting. Primary bracts subulate or subulate-setaceous, 4–8 mm. long, very narrow, deciduous at anthesis; secondary bracts setaceous, 1–2 mm. long, deciduous. Pedicels very slender, 5–7 mm. long, ascending-hirtellous with cinereous hairs. Dried flowers 16–18 mm. long. Calyx about 4.5 mm. long, strigillose with cinereous hairs, the upper lobes subulate, 1.5–2 mm. long, the lateral deltoid at the base, contracted into a subulate tip, 2.5–3 mm. long, the lowermost subulate, 2.5–3 mm. long. Corolla "white tinged with purple" (Brandegee), the banner with a green spot at the base and yellowish to brownish when dry; blade of the banner oval, ca. 15 mm. high, 11–12 mm. broad, silky with fine hairs on the back, the claw 2–2.5 mm. long; wings 15–17 mm. long, 3.5–4.5 mm. wide, auricled at the base on the upper side, the claw ca. 2.5 mm. long; keel shallow, 18–20 mm. long, scarcely or not at all auricled, the claw ca. 3 mm. long. Staminal tube 12–14 mm. long, the vexillary stamen adnate to the sheath, free at the base, with a conspicuous 2-lobed callosity



on the upper side near the base. Ovary strigillose, 8–11-ovulate. Legume slightly sinuate, curved upward near the end, 4.5–6 cm. long, 4–4.5 mm. wide, ascending or spreading, brown, densely hirtellous with cinereous hairs 0.2–0.4 mm. long, appearing hoary, velvety; seeds (3–)8–11, oval to oblong in outline, cylindrical to compressed, 3–3.8 mm. long, 1.8–2.4 mm. wide, light brown to gray, variegated with black or brown. Somatic chromosomes 22.

**DISTRIBUTION.** Central Sinaloa and adjacent Durango, Mexico. Map 1.

**SPECIMENS EXAMINED.** MEXICO. SINALOA: Bush, 6 ft., Cerro Colorado, vicinity of Culiacán, *Brandege*, 1904 (GH, POM, UC, US). DURANGO: Slender shrub 2 m. high, rocky grassy slopes in oak forest, 3000 ft., Sierra Tres Picos, *Gentry* 5279, 19 Dec. 1939 (DS, GH, MEXU, MO, NY, UC).

Although this plant is poorly known, it appears to be a distinct species. It is reminiscent in appearance of both *Tephrosia leiocarpa* and *T. multifolia*, but is easily distinguished from the former by the narrow, hirtellous pods and from the latter by the spreading or ascending pods, the leaflet-shape (which is closer to that of *T. leiocarpa*), the short trichomes of a single length on pedicels, calyx and fruit and the presence of both terminal and axillary inflorescences. Most herbarium-specimens of *T. multifolia* show only axillary inflorescences, and even when both types are present the axillary inflorescences are usually first and best developed.

### 3. *Tephrosia macrantha* Robinson & Greenman ex Pringle

*Tephrosia macrantha* Robinson & Greenman ex Pringle, *Garden & Forest* 7: 153, 173. fig. 32. May 1894. Tequila, Jalisco, Mexico.

*Tephrosia macrantha* Robinson & Greenman, *Proc. Amer. Acad.* 29: 383. June 1894. "Hills," Tequila, Jalisco, Mexico, *C. G. Pringle* 4454, 5 Oct. 1893 (GH-Type; A, MEXU, MO, PH, UC, US).

*Cracca macrantha* (Robinson & Greenman) Rose, *Bot. Gaz.* 40: 103. 1905.

Erect herbaceous perennial or shrub 1–4 m. high, much branched, the branches monopodial, often sulcate, angled to terete. Branches, axes of the inflorescences, petioles and rachises finely hirtellous with recurved or ascending hairs and hirsutulous with ascending to downwardly and outwardly spreading hairs or strigillose and short-strigose with antrorsely directed hairs. Leaves spreading or ascending, the principal leaves 6.5–22 cm. long, the petioles (7–)11–30 mm. long, shorter or longer than the lowermost leaflets, the rachis (4–)5–16 cm. long; stipules linear-acuminate, 10–15 mm. long, 1 mm. or less wide, deciduous or often detached; leaflets of the principal leaves 13–31, linear-elliptic to elliptic or linear-oblong to



oblong-lanceolate, the base obtuse or somewhat cuneate, the apex acute, obtuse, rounded or retuse, short-mucronate; leaflets 15–55 mm. long, 4–12(–14) mm. wide, 2.5–4.5 times as long as broad, the terminal leaflet often somewhat smaller than the lateral; leaflets thin, pale beneath, the veins often conspicuous, thinly to densely strigillose, hirtellous or hirsutulous beneath with cinereous hairs, appearing somewhat canescent, or often rusty along the midrib. Inflorescences terminal and axillary (occasionally 2 from 1 axil), 5–25 cm. long, the peduncles 1.5–4.5 cm. long, the flowering nodes 6–ca. 35, somewhat buttressed below; buds 3–5 at a node, apparently 2 or 3 flowering, 1 or 2 fruiting. Primary bracts linear, gradually acuminate, 6–12 mm. long, 1 mm. or less wide, deciduous at anthesis; secondary bracts linear-setaceous, 3–6 mm. long, deciduous. Pedicels 8–11 mm. long, very slender, ascending in flower. Dried flowers (18–)20–26 mm. long. Calyx campanulate, 6–6.5 mm. long, hirtellous or both strigillose and short-strigose or hirtellous and hirsutulous, the upper lobes acuminate, 1.5–2.5 mm. long, the lateral and lowermost lanceolate, acuminate, to lance-subulate, 4–5 mm. long and 4.5–5.5 mm. long, respectively. Corolla showy, apparently white, becoming lavender, and brown or lavender in dried specimens; banner strongly recurved in flower, finely silky-hirsutulous on the back, the blade oval to suborbicular, with a conspicuous green spot at the base, 20–22 mm. high, 17–19 mm. broad, the slender claw 4–4.5 mm. long; wings oblong, obscurely auricled at the base, 23–27 mm. long, 4–5 mm. wide, the claw 4.5–5 mm. long; keel shallow, exauriculate, 21–26 mm. long, the slender claw 5.5–6 mm. long. Staminal tube 18–22 mm. long, the vexillary stamen with a prominent angular or collar-like callosity near the base, coherent, except at the base, with the tube which bears a prominent knob on the free edge at either side near the base. Ovary densely silky-strigillose with fine rusty or tawny hairs. Mature fruit unknown, the half-ripe legume scimitar-shaped, the proximal portion straight, the distal portion curved upward, 5–6.5 cm. long, 4.5 mm. wide, densely hirtellous with tawny hairs, drooping; seeds 8–10, the mature seeds unknown. Flowering collections from September through November.

DISTRIBUTION. At altitudes of 400–1400 m. in Jalisco, México, Colima and Guerrero, Mexico. Map 2.

SPECIMENS EXAMINED. MEXICO. JALISCO: Hills, Tequila, *Pringle 4554* (A, GH, MO, MEXU, PH, UC, US); barranca of Guadalajara, 4000 ft., *Pringle 11435* (GH, US), *M. E. Jones 27206*, 1930 (NY, UC, US); near Guadalajara, *Rose & Painter 7352* (GH, NY, US); Etzatlán, *Holway 5100* (US), *Rose & Painter 7526* (GH, US). COLIMA: Tuxpan Canyon, *Orcutt 5316*, 1910 (US). GUERRERO: Sierra Madre, 1300 m., *Langlassé 596* (GH, US) (See discussion, *T. major*); oak forest, Sierrita-Palo Solo, Dist. Galeana, 600 m., *Hinton 14999* (GH); trail west of Suriana, Ashotla, Sierra Madre del Sur north of Río Balsas, Dist. Aldama, *Mexia 8806* (GH, MO, NY, UC, US); Temixco, 400 m., *Reko 5013* (US); oak forest, San Antonio, Dist. Montes de Oca, *Hinton 11558* (GH). MÉXICO: Llano, Plaza de Gallos, Dist. Temascaltepec, 1200 m., *Hinton 5172* (A, NY, US); hill, Tenayac, Dist. Temascaltepec, 1380 m., *Hinton 5099* (GH).



The handsome large flowers of this plant are its most outstanding feature; even on herbarium-specimens these usually exceed 20 mm. in length. The slender keel, 21–26 mm. long, with a long claw, the long staminal tube with prominent callosities, the shrubby habit and the numerous thin leaflets are particularly characteristic. Most specimens have retrorse pubescence on stems, petioles and rachises, but this is by no means constant.

Pringle inadvertently described this species in *Garden & Forest* in May, 1894, in advance of the formal description by Robinson and Greenman in June of the same year. Pringle had, however, noted in the April issue of that journal that "*Tephrosia macrantha* Robinson & Greenman" was one of the new species discovered by him on his Mexican collecting trip of 1893 and that it would be figured and described in a subsequent issue. His brief, informal description, accompanied by an excellent drawing of this plant, constitutes publication of the species, so that the proper citation is *Tephrosia macrantha* Robinson & Greenman ex Pringle. In view of the unusual publication of the name, the Type of the species should be the specimen designated by Robinson and Greenman in their much more complete description.

#### 4. *Tephrosia Sinapou* (Buc'hoz) A. Chev.

*Galega frutescens*, *flore purpurea, foliis sericeis* Burm. Plum. Ic. 126. pl. 235. 1750.

*Cytisus?* 2. P. Browne, Civ. & Nat. Hist. Jamaica, ed. 1. 296. 1756.

*Galega Sinapou* Buc'hoz, Hist. Univ. Reg. Veg. pl. 994. 1775. Without description; figure and name only, but the figure diagnostic.

*Tephrosia Sinapou* (Buc'hoz) A. Chev. Compt. Rend. Acad. Sci. Paris **180**: 1522. 1925, as *Sinapou*.

*Galega sericea* Lam. Encyc. **2**: 596. 1786, not Thunb. 1800, Buch-Ham. 1822, nor *Tephrosia sericea* (Thunb.) Pers. 1807, nor *T. sericea* Baker in Oliver, 1871.

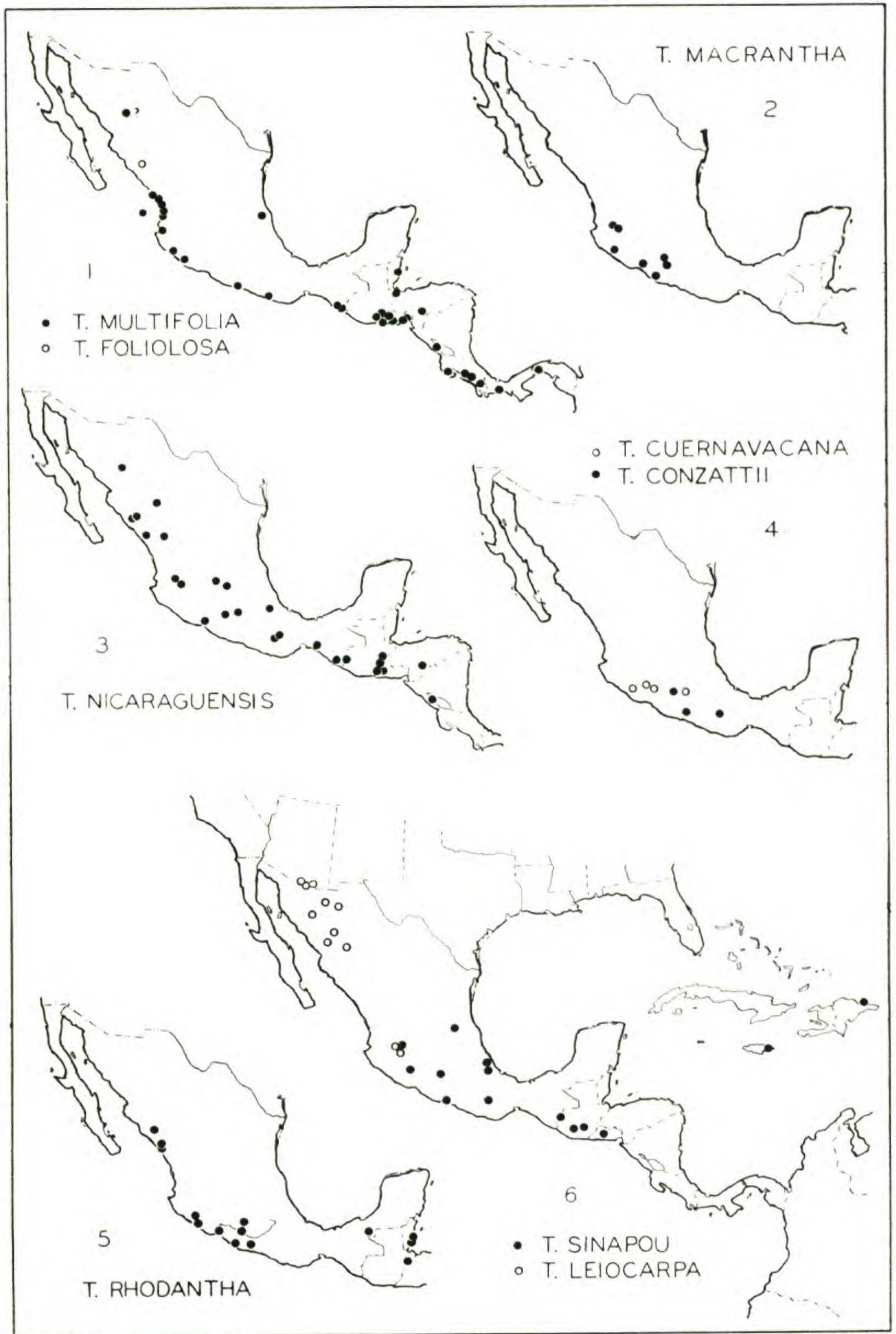
*Galega toxicaria* Sw. Prod. Veg. Ind. Occ. 108. 1788. Diagnosis inconclusive but based on *Galega frutescens*, etc. Burm. and *Cytisus?* 2. Browne, both of which are undoubtedly this species.

*Tephrosia toxicaria* (Sw.) Pers. Syn. Pl. **2**: 329. 1807.

*Cracca toxicaria* (Sw.) Kuntze, Rev. Gen. **1**: 175. 1891.

*Tephrosia emarginata* HBK. Nov. Gen. et Sp. (folio) **6**: 361. Sept. 1824; Op. cit. (quarto) **6**: 461. Sept. 1824. "*Crescit ad ripam Atabapi, prope La Divina Pastora de San Balthasar, (Misiones del Orinoco),*" Humboldt & Bonpland, May 1800. This locality is apparently on the Río Atabapo near San Fernando de Atabapo, Colombia-Venezuela boundary between







Dept. Vaupes, Colombia, and Terr. Amazonas, Venezuela. (See Sandwith, *Kew Bull.* **1925**: 295–310. 1925.)

*Tephrosia Schiedeana* Schlecht. *Linnea* **12**: 299. 1838. Barranca de Tioselo near Hacienda de la Laguna, near Jalapa, Veracruz, Mexico, Schiede, 29 Aug. 1829 (GH, NY).

*Cracca Schiedeana* (Schlecht.) Standl. *Contr. U. S. Nat. Herb.* **23**: 474. 1922.

*Orobus sericeus* Sessé & Moc. *La Natureleza II.* **1**: app. 118. 1889. New Spain (Mexico). Fragments of *Sessé & Mociño 3736* (F), marked "*Orobus sericeus*, N[obis]," are *T. Sinapou* and *T. multifolia* Rose. The description applies to *T. Sinapou*, although the characters given are not diagnostic.

Erect herbaceous or suffrutescent perennial to 1 m. high; stems prominently sulcate and angled, branching monopodially. Stems, petioles, rachises, petiolules, axis of inflorescence and pedicels densely hirtellous to hirsutulous with rusty or cinereous, often recurved or retrorse hairs, appearing velvety. Leaves (11–)16–35 cm. long, ascending or spreading, the petiole (7–)20–50 mm. long, longer or shorter than the lowermost leaflets, the rachis (8–)12–25 cm. long; stipules linear, acuminate, to linear-setaceous, 10–17 mm. long, 1 mm. or less wide, persistent, but often broken in herbarium-specimens; leaflets of the principal leaves 17–41, narrowly elliptic to linear-oblong or oblong-oblongeolate to linear-lanceolate, mucronate, 2–6 cm. long, (4–)7–18.5 mm. wide, 3.5–6 times as broad, thin, dull, pale beneath, moderately hirtellous to hirsutulous with fine cinereous hairs above, densely hirtellous to hirsutulous with ascending or somewhat appressed cinereous hairs beneath, appearing somewhat silky or dull, the midrib and principal lateral veins sometimes outlined with hairs; petiolules 1–2.5 mm. long. Inflorescences terminal and from the upper axils, the terminal often with 1–7 branches from the axils of bracts, leafless or rarely the terminal inflorescence with a leaf at the lowermost node, (2–)4–30 cm. long, longer or shorter than the leaves, ascending, the peduncle 2–8 cm. long, sulcate, angled, the flowering nodes 5–ca. 25; buds about 6 at a node, 5 of these flowering, 1–3 fruiting. Primary bracts linear-lanceolate, acuminate, 6–8 mm. long, 1–1.5 mm. wide, apparently deciduous soon after anthesis; secondary bracts linear-setaceous, 5–6 mm. long, 0.5 mm. wide, deciduous. Pedicels 5–8 mm. long, ascending, becoming stout in age. Dried flowers 16–22 mm. long. Calyx 5.5–8.5 mm. long, densely hirtellous to strigillose with cinereous or rusty hairs, the upper lobes nearly completely fused, the free portion 1–3.5 mm. long, the lateral lobes oblong to obovate, abruptly and usually obliquely short-acuminate, 2.5–4 mm. long, 1.5–3.5 mm. broad, the lowermost lanceolate-ovate to ovate or obovate, 3.5–5.5 mm. long, 2–4 mm. broad. Corolla white, the base of the banner with a green spot, the wings marked with violet on the upper side near the base; corolla apparently becoming pinkish or purplish in age; blade of the banner suborbicular, 13–15 mm. high and broad, densely silky-strigose with fine hairs on the back, the claw 2.5–4 mm. long; wings 13–19 mm. long, 3.5–4.5 mm. broad, auricled on the upper side near the base, the claw 3–4 mm. long; keel 14–19 mm. long, the claw 4–5 mm. long.



Staminal tube 11–14 mm. long, the vexillary stamen coherent with the tube, free at the base, with a prominent 2-lobed callosity on the upper surface. Ovary densely hirsutulous or short-strigose, silky; ovules 10–13. Legume nearly straight or slightly curved downward, ascending or spreading, (3.5–)4.5–5.5 cm. long, 4–6.5 mm. wide, hirtellous and hirsutulous with rusty or cinereous hairs, these sometimes somewhat appressed and appearing silky; seeds 8–13, oval-reniform to subquadrate in outline, 2.6–4 mm. long, 2.2–2.6 mm. broad, brown, variegated with black. Somatic chromosomes 22.

**DISTRIBUTION.** San Luis Potosí and Veracruz, in eastern Mexico, and Jalisco, in western Mexico, to Guatemala and El Salvador; Jamaica, Hispaniola; Colombia to Ecuador and Peru and in Venezuela, the Guianas, Brazil and Bolivia, primarily in the Amazon drainage; often cultivated. Map 6 (North American localities).

**SPECIMENS EXAMINED.** MEXICO. Without locality, *Sessé, Mociño, Castillo & Maldonado 3736*, 1787–1795–1804 (F); *Muller 958* (NY). SAN LUIS POTOSÍ: Barranca, Las Canoas [west of Rascón], *Pringle 5049* (GH). VERACRUZ: Orizaba, *Muller 1318* (NY); Orizaba, *Botteri 370* (GH); Mt. Orizaba, *Seaton 506* (GH); region of Orizaba, Borrego, *Bourgeau 2797* (GH), *2797b* (GH); rocky slope, north side of Borrego, Orizaba, *Clausen & Cervantes G. 6215* (MEXU); barranca of Tioselo near Hacienda de la Laguna (near Jalapa), *Schiede*, 1829 (GH, NY); Fortín, Zacuapán, *Purpus 7479* (UC); oak forest, Zacuapán, *Purpus 16368* (A, F); dry open brush woods, sunny slopes, Barranca de Tenampa, Zacuapán, *Purpus 1889* (GH, MO, NY, UC, US). JALISCO: Río Blanco, *Palmer 220* (part), 1886 (GH, K, PH, US); Guadalajara, *Palmer 322*, 1886 (GH, NY, PH, US); barranca of Río Blanco near Guadalajara, 4500 ft., *Pringle 11436* (GH, MEXU, US). MÉXICO: Llano, Luvianos, Dist. Temascaltepec, *Hinton 8114* (GH, US); Volcán, Dist. Temascaltepec, *Hinton 4683* (F, GH, NY, US). MICHOACÁN: Open pine forest above Achuato, Apatzingán, 3200 ft., *Leavenworth & Hoogstraal 1624* (F, GH, MO, NY). OAXACA: Oaxaca, *Nelson*, 1894 (US).

**GUATEMALA.** GUATEMALA: Without locality, *Aguilar 110* (F); near Guatemala, *Hayes 25* (GH, US). HUEHUETENANGO: Rocky slopes above La Libertad, on Cerro Pueblo Viejo, 1900 m., *Steyermark 50991* (F); trail between Democracia and Santa Ana Huista, Sierra de los Cuchumatanes, 800–1000 m., *Steyermark 51312* (F). SOLOLÁ: Dry slopes above San Pedro village, 1900–2000 m., *Steyermark 47163* (F).

**EL SALVADOR.** Inzacatal, vicinity of San Salvador, 650–850 m., *Standley 22395* (US).

**DOMINICAN REPUBLIC.** In clearing, Las Lagunas, Cordillera Central, Prov. de Azua, 750 m., *Ekman H6356* (US); vicinity of Laguna, Samaná Peninsula, chiefly on the Pilón de Azucar, 100–500 m., *Abbott 267* (US).

**JAMAICA.** Brandon Hill, 330 m., *Fawcett 8045* (F, NY); Castleton, *Harris* (NY).



COLOMBIA. Without data, *Mutis 1199* (US); Municipio Florencia, Hacienda "Morelia", 225 m., *Plata G. 79* (US). BOYACÁ: Río Meta, Cubarral, 180 m., *Cuatrecasas 3668* (US). CHOCÓ: Lloró, 50 km. s. e. of Quibdó, at junction of Río Atrato and Río Andaguada, *Archer 2116* (US); Río Pató, affluent of Río Quito, *Archer 2113* (US). CUNDINAMARCA: La mesa, between Giradot and Facatativa, *Bro. Ariste-Joseph A390* (US). HUILA: Neiva, *Archer 3349* (US). MAGDALENA: Open pasture, mts. just east of Manaure, 1700 m., *Haught 4107* (US); northern slope of Sierra Nevada de Santa Marta, *Seifriz 604* (PH). PUTUMAYO: Mocoa, Río Mocoa, 570 m., *Cuatrecasas 11356* (US), *Archer 3409* (US). VALLE DEL CAUCA: La Paila, *Holton, 1853* (GH, PH); Almaguer, *Lehmann 6147* (US); Popayán, *Archer 3382* (US); La Capilla, 1760 m., Popayán, *Arbelaez & Cuatrecasas 6028* (US); La Trojita, Río Calima (region del Chocó), 5–50 m., *Cuatrecasas 16500* (US); Río Palo between Tacueyó and El Palo, 1450–1700 m., *Cuatrecasas 19540* (A, US); Río Garrapatas, west of Andes of Roldanilla, *Lehman 8399* (F, GH, US). VICHADA: Ruins of burnt finca, Río Vichada at Masaguaro, 100 m., ca. 30 km. n.e. of San José de Ocné, *Hermann 11017* (US); El Porvenir, Río Meta, 145 m., *Cuatrecasas 4443* (US).

ECUADOR. CARCHI: Cultivated, Maldonado, *Steere 8071* (F). CHIMBORAZO: Tixán, *Rose & Rose 22406* (GH, US). NAPO-PASTAZA: Cultivated in open field, trail Puyo to Canelos, "Chacra" of Sebastián, 1100 ft., *Mexia 6836* (UC). TUNGURAHUA: Humid forest, San Francisco, 10 mi. n.e. of Ambato, 8500 ft., *Tate 567* (US).

PERU. *Ruiz & Pavon 21/3, 1778–1788*; Santa Ana, 900 m., *Cook & Gilbert 1436* (US). AYACUCHO: Cultivated, Aina, between Huanta and Río Apurímac, 750–1000 m., *Killip & Smith 23189* (US), *22558* (F, US), *22300* (F, US). CUZCO: *Bues, 1930* (F); Machu Picchu, 2100 m., *Cook & Gilbert 1018*. HUANUCO: Pampayacu, *Kanehira* (F, GH); between Huanuco and Pampayacu, *Kanehira* (A). JUNÍN: Colonia Perené, *Rodriguez, 1930* (US); cultivated, Río Pinedo, north of La Merced, 700–900 m., *Killip & Smith 23645* (US); brushy slope, La Merced, 4000 ft., *Macbride 5661* (F); cultivated, east of Quimiri Bridge, La Merced, 800–1300 m., *Killip & Smith 23880* (US); cultivated, Río Perené, near Hacienda 3, Colonia Perené, 600 m., *Killip & Smith 25134* (F, US); cultivated, Pichis Trail, Yapas, 1350–1600 m., *Killip & Smith 25489* (F, US); cultivated, Pichis Trail, Eneñas, 1600–1900 m., *Killip & Smith 25719* (F, GH, US), *25731* (US); Puerto Bermudez, 375 m., *Killip & Smith 26608* (US). LORETO: Forest, Mishuyacu, near Iquitos, 100 m., *Klug 720* (US), cultivated, *1011* (F, US); Hacienda of C. W. Perry, Puerto Leguia, *Killip & Smith 27503* (F, US); clearing, Balsapuerto, lower Río Huallaga basin, 150–350 m., *Killip & Smith 28459* (F, US); clearing, Santa Rosa, lower Río Huallaga below Yurimaguas, 135 m., *Killip & Smith 28811* (F, US); clearing, Peña Blanca, on Río Itaya, 110 m., *Killip & Smith 29677* (F, US); lower Río Nanay, *L. Williams 441* (F, US); Palta-Cocha on the upper Río Nanay, *L. Williams 1267* (F); Santa Rosa, lower Río Huallaga, 155–210 m., *L. Williams 4959* (F); Yarina Cocha, 155 m., *Tessmann 5407* (US-photo).



BOLIVIA. LA PAZ: Polo-Polo near Coroico, 1100 m., *Buchtien 3785* (F, GH, US), *662* (F). Locality illegible, *M. Cardenas 2010* (US).

VENEZUELA. AMAZONAS: Cultivated, San Carlos, Río Negro, 100 m., *L. Williams 14635* (F, US). ANZOÁTEGUI: Río Chive, *Pittier 15054* (US). BOLIVAR: Cultivated, Mata Negra, south of El Tigre, 100 m., *L. Williams 13389* (F, US). TACHIRA: Cultivated, but seed brought from Mesa Rica Mts. near by, San Cristobal, *Archer 3200* (US).

BRITISH GUIANA. Cultivated, Bootooba, Demerara River, *Persaud 63* (F); upper Mazaruni River, long. ca. 60° 10' W., *De La Cruz 2074* (F, GH, US); dry sandhills east of Rockstone, *Gleason 822* (GH, US); Indian clearing, Tumatumari, *Gleason 325* (GH, US), *388* (GH, US); cultivated, Bonisika Landing, Arawau River, Northwest Dist., *Archer 2315* (US); Morawhanna, *Archer 2421* (US); cultivated, Mabaruma Compound, Northwest Dist., *Archer 2247* (US); Pirara, etc., *Schomburgk 267* (US); Waramuri Mission, Moruka River, *De La Cruz 2503* (F, GH, PH, US), *2594* (F, GH, PH, US).

SURINAME. Cultivated, Carolina and vicinity, *Archer, 2883* (US); cultivated, 22 km. south of Paramaribo, *Archer 2880* (US); cultivated, Vredenburg Weg, *Archer 2858* (US); Scotelweg, *Archer 2646* (US, UC); Forest of Zandery, *Samuels 517* (F, GH, US); cultivated, Sandrij Id., *Archer 2768* (US); Paramaribo Botanic Garden, *Fairchild, 1932* (US).

FRENCH GUIANA. Karouany, *P. Sagot 121, 1858* (GH).

BRAZIL. Voyage de M. le Dr. *Jobert* au nord du Bresil, 1877-78 (F); Río Juanambu ad confluens Río Buesaquito, 1250 m., *André 2893* (F, GH). AMAZONAS: Cultivated, Río Branco, Boa Vista, *Ducke 1383* (A, US). MARANHÃO: Cultivated, Ubim, Maracassume River Region, *Froes 1729* (A, F, US). PARÁ: Cultivated, Tapana, near Pará, *Killip & Smith 30233* (US), *30234* (US); vicinity of Santarem, *Spruce, Aug. 1850* (GH).

*Tephrosia Sinapou* is an easily recognized species of Mexico and Central and South America where it is still employed as a fish-poison and insecticide. In pre-Columbian times its culture was presumably widespread in the Caribbean area but the plant is now limited in that region to Hispaniola and Jamaica. The species is distributed from Veracruz, on the east, and Jalisco, on the west of Mexico, southward to Guatemala and El Salvador, but there a gap appears in the range, for the plant apparently skips the remainder of Central America to reappear in Colombia, Venezuela, the Guianas, Brazil, Bolivia, Peru and Ecuador, primarily in the Amazon Basin. The two areas so defined seem to have populations which differ somewhat in the shape and width of the calyx-lobes. On specimens from Central America, the lateral calyx-lobes are oblong to obovate and abruptly and obliquely short-acuminate, while the lowermost lobe is ovate or obovate. In many South American collections there seems to be



a strong tendency toward narrower calyx-lobes, particularly in the eastern part of this area, so that the lateral lobes may be oblong and the acumination less oblique; the lowermost lobe may be lance-ovate or ovate. There are many intermediates between the two types and the problem needs to be studied more carefully to determine the amount of variability in populations throughout the range.

It is conceivable that differences between the Central and South American plants may be due at least in part to selection in cultivation. Throughout much of the range in South America the plant seems to be represented primarily in cultivation and it is likely that it would not persist in many areas without continued care. Ducke (1939, p. 112–113), for example, records specimens from Santarem in Pará and Parintins in Amazonas, Brazil, and notes that this species occurs in abandoned places, probably growing subsponaneously in Amazonia. If the plant has been spread primarily by man in these regions in connection with its use as a fish-poison, as seems likely, it is possible that considerable selection may have taken place.

The species is likely to be confused only with *Tephrosia multifolia* Rose which occurs from Mexico southward to Panama; the two may be distinguished immediately by the calyx-lobes and inflorescences. The oblique contraction of the lateral lobes of the calyx of *T. Sinapou* is usually evident and is not found in *T. multifolia* in which the lobes are lance-subulate to narrowly triangular and evenly acuminate. The inflorescences of *T. multifolia* are primarily axillary (at least on herbarium-specimens) while those of *T. Sinapou* are definitely terminal and from the upper axils.

Unfortunately, the well-established name *Tephrosia toxicaria* (Sw.) Pers., by which this plant has long been known, must be discarded in favor of the combination *Tephrosia Sinapou*, based on *Galega Sinapou* Buc'hoz. The basonym rests solely on a single plate, without description, but quite recognizable as this species (the South American and Caribbean form), including crude dissections of the flower which satisfy the requirements of Art. 44, International Rules of Botanical Nomenclature, ed. 3. There seems to be no way of avoiding this change to the earlier name.



Although "*Tephrosia toxicaria*" has been mentioned frequently in ethnological writings and in connection with studies on rotenone, it is impossible to determine whether the plant in question is *T. Sinapou* or *T. multifolia*, which has been confused taxonomically with this species and which was also known for a period as *T. Schiedeana* (= *T. Sinapou*). Although the rejection of so appropriate a name as *T. toxicaria* is to be lamented, the lapse of this name will perhaps contribute to clarity in preventing future confusion as to which species is intended. The documentation of ethnological, chemical, insecticidal and agricultural researches with specimens of the plants involved would prevent the invalidation, which occurs in a case such as this, of much work of this type. One happy circumstance in this particular instance is that, since *T. multifolia* is not known to occur in South America, reports of *T. toxicaria* from that region may be referred to *T. Sinapou* with reasonable certainty, the only other large species with which this can possibly be confused being the introduced *Tephrosia candida* DC., a very different plant.

#### 5. *Tephrosia leiocarpa* A. Gray

*Tephrosia leiocarpa* A. Gray, Pl. Wright. **2**: 36. 1853. "On the Sonoita, near Deserted Rancho, Sonora" (probably near the middle of the base of the east side of the Huachuca Mountains, southwestern Cochise County, Arizona), *C. Wright* 965, 15-16 Sept. 1851 (GH-Type; NY, PH, US).

*Cracca leiocarpa* (A. Gray) Kuntze, Rev. Gen. **1**: 175. 1891.

*Tephrosia affinis* S. Wats. Proc. Amer. Acad. **21**: 424. 1886. Hacienda San José (about 25 miles south of Batopilas on the Río Batopilas), southwestern Chihuahua, Mexico, *E. Palmer* 55, Sept. 1885 (GH-Type; MEXU, NY, PH, US).

*Cracca affinis* (S. Wats.) Rose, Contr. U. S. Nat. Herb. **12**: 269. 1909.

*Tephrosia viridis* M. E. Jones, Contr. West. Bot. **12**: 7. 1908. Guayanopa Canyon, Sierra Madre, 3600 ft., Chihuahua, Mexico, *M. E. Jones*, 24 Sept. 1903 (POM-Type; DS, POM, US).

*Cracca calva* Rydb. N. Amer. Fl. **24**: 161. 1923. Slopes of the barranca of Guadalajara, Jalisco, Mexico, 4500 ft., *Pringle* 9773, 11 June 1902 (NY-Type; GH, MO, US).

Suffrutescent perennial or low shrub, 3.5-ca. 10 dm. high, from a thick woody root; stem much branched, monopodial, terete or obtusely angled, sulcate; bark of woody portions tan to brown, striate. Stems, petioles, rachises, petiolules, axes of inflorescences, pedicels and calyces strigillose with fine cinereous or golden hairs. Leaves principally 6-15 cm. long, the petiole 7-32 mm. long, longer or shorter than the lowermost leaflets, the lower petioles longer than the upper, the rachis 2.3-7.2 cm. long; stipules linear-setaceous, 4-12 mm. long, 0.5 mm. or less wide, persistent,



brown, erect or ascending; leaflets of the principal leaves 9–23(–27), linear-oblong to oblong-ob lanceolate or elliptic, 11–43 mm. long, (3–)4–12 mm. wide, 3–6 times as long as broad, the apex obtuse, rounded or retuse (terminal leaflets), mucronate, bluish-green (when fresh), glabrous above, sparsely to moderately strigillose beneath with fine cinereous hairs, the veins prominent, stramineous or brownish; petiolules slender, 1–3 mm. long. Inflorescences terminating the principal stem or axillary branches, often with 1–7 branches from the axils of bracts so as to appear paniculate, usually leafless (occasionally the lowermost flowers in the axil of a leaf), the branches straight, erect or ascending, often exceeding the leaves, 3–27 cm. long, the peduncle 0.2–9 cm. long; flowering nodes 3–25, the buds 3–6 (–7) at a node, 2–4 flowering and 1 or 2 fruiting. Primary bracts linear-setaceous, 4–9 mm. long, 0.5–0.7 mm. wide, becoming brown, usually deciduous at or soon after anthesis; secondary bracts about 3 mm. long, nearly setaceous, deciduous. Pedicels 4–7 mm. long, ascending. Dried flowers 15–19 mm. long. Calyx 4.5–6 mm. long, the upper lobes subulate, 1–2.5 mm. long, the lateral deltoid, short- or long-acuminate, 2–3.5 mm. long, the lowermost lanceolate, acuminate, 3–5 mm. long. Corolla white, becoming pink and then carmine in age, the banner with a pale green spot at the base and the back brownish or rusty; blade of the banner oval, rarely slightly auricled at the base, 12–17 mm. high, 11–15 mm. broad, finely strigillose on the back, the claw 2.5–3.5 mm. long; wings linear-oblong, or obliquely so, auricled, 14–20 mm. long, 3–5.5 mm. wide, the claw 3–4 mm. long; keel 15–18 mm. long, with or without an auricle at the base, the claw 2.5–4 mm. long. Staminal tube 12–15 mm. long, the vexillary stamen with a conspicuous callosity near the base, coherent with the tube for about 1/3 of its length, free at the base. Ovary glabrous or strigillose along the upper suture. Legume nearly straight, spreading or ascending, (3–)5–6.5 cm. long, 5–6.5 mm. wide, glabrous or with a few fine hairs on the upper suture, narrowed at the base; seeds (3–)9–11, oval to oblong-reniform, brown variegated with black, (2.8–)3.4–4.8 mm. long, 2.6–3 mm. wide. Somatic chromosomes 22. Flowering collections from mid-June (Jalisco) to late July and early September.

**DISTRIBUTION.** Dry, well-drained slopes in pineland, oak woodland, or open rocky ground, at 1000–1500 m., from southern Arizona to Sonora western Chihuahua and the region of Guadalajara, Jalisco, Mexico Map 6.

**SPECIMENS EXAMINED.** UNITED STATES. ARIZONA. Cochise Co.: Sonoita Valley near Deserted Rancho (probably near the middle of the eastern base of the Huachuca Mts.), *Wright 965* (GH, NY, PH, US). Pima Co.: Dry southern slope near trail to top of Mt. Baboquivari, 5200 ft., *Gould, Darrow & Haskell 2725* (CAS, MO, US); west slope, Baboquivari Mts., 3000–4500 ft., *Gentry 3450* (CAS) Santa Cruz Co.: Patagonia Mts., *Peebles & Harrison 4740* (US); Patagonia Mts., 4500 ft., *Kearney & Peebles 14815* (CAS, UC); Nogales to Ruby, 4700 ft., *Kearney & Peebles 14918* (GH, POM, NY, US); Sonoita Valley, 4600 ft., *Rothrock 685* (F, GH, NY, PH, US).



MEXICO. SONORA: Pineland burned June 1939, Puerto de los Aseraderos, region of Río Bavispe, *White 3008* (GH); oak grasslands, Cañon del Agua Amarga, region of Río Bavispe, *White 3626* (GH) (for map see White 1948); gravelly slope in the Sierra Batuc, 8 mi. n.e. of Mátape on the road to Batuc, 3300 ft., *Wiggins & Rollins 424* (DS, NY); xeric oak slope, Sierra de Alamos, 3500 ft., *Gentry 4894* (DS, GH, MO, NY); Sierra de Alamos, *Rose, Standley & Russell 12816* (NY, US). CHIHUAHUA: Guayanopa Cañon, Sierra Madre, 3600 ft., *M. E. Jones*, 1903 (DS, POM, US); Río Aros, *LeSueur 1348* (F); Río Benito, *LeSueur 695* (F, GH, MO, TEX); Hacienda San José, 25 mi. south of Batopilas, *Palmer 55*, 1885 (GH, MEXU, NY, PH, US); oak slopes and flats, Guasaremos, Río Mayo, *Gentry 2414* (A, F, MO, UC, US). JALISCO: Near Guadalajara, *Rose & Painter 7353* (NY, US); hillsides near Guadalajara, *Pringle 2873* (GH); barranca of Guadalajara, *Rose & Painter 8027* (US), *Rose & Hough 4826* (US), *Pringle 9773* (GH, MO, NY, US), *Pringle 11434* (GH, US); rocky slopes near top of Barranca de los Oblatos (Barranca Grande or Barranca of Guadalajara) below and near road to Los Baños, about 5 mi. north of Guadalajara, *Moore & Wood 4818* (GH, UC, Bailey Hortorium); barranca near Guadalajara, *Pringle 4451* (GH, MEXU, NY, MO, PH, UC, US); Río Blanco, *Palmer 220* (part), 1886 (GH, NY, US), *594*, 1886 (GH, MEXU, MO, NY, PH, US); vicinity of La Venta, Lake Chapala, *Lemmon & Lemmon*, 1905 (UC).

Collections of this species from the region of Guadalajara, Jalisco, have been designated *Cracca calva* Rydb. These plants supposedly differ from typical *Tephrosia leiocarpa* in having "calyx lobes distinctly longer than the tube; wing petals obliquely obovate," rather than "calyx lobes about equalling the tube; wing petals oblong." The calyx-lobes of *C. calva* are noted as subulate, 4 mm. long, the tube 2.5–3 cm. [mm!], while the lobes of *T. leiocarpa* are lanceolate, 3 mm. long, the tube 2.5–3 mm. long. Neither of these characters can be applied with any degree of satisfaction. In all the material I have seen, the wings of the corolla are very nearly identical, exhibiting parallel variations. The ratio of calyx-lobes to tube has proved throughout the genus to be rather inconsistent, so that it has been used as little as possible as a taxonomic character in this study. The present species seems to be no exception, for the calyx-lobes of some specimens from both areas exceed the tube. It should also be noted that the upper, lateral and lowermost lobes are all of different lengths.

Many calyces from the northern area are nearly cylindrical, while most of those from Jaliscan material are campanulate. Unfortunately, however, neither the shape of the calyx nor the



length of the calyx-lobes is constant; the ranges of the latter are given below:

	<i>Calyx-length</i>	<i>Upper lobes</i>	<i>Lateral lobes</i>	<i>Lowermost lobe</i>
Arizona, Sonora, Chihuahua	4.5–6 mm.	1–2 mm.	2–3.5 mm.	3–4.5 mm.
Jalisco	5–5.5 mm.	2–2.5 mm.	3 mm.	4–4.5 mm.

These extremes in themselves can hardly be considered significant as distinguishing characteristics, and not enough individual plants are available to determine the differences between the two areas statistically.

The only differences evident in the Jaliscan specimens are tendencies toward slightly longer peduncles of the inflorescences, the occasional occurrence of a leaf at the first node of the inflorescence, slightly longer calyx-lobes than in many northern specimens and a more nearly campanulate calyx. These do not, however, seem to constitute sufficient bases for the retention of *Cracca calva* as a separate entity in spite of the apparent disjunction in the range between Chihuahua and Jalisco.

#### 6. *Tephrosia Conzattii* (Rydb.) Standl.

*Cracca Conzattii* Rydb. N. Amer. Fl. **24**: 162. 1923. Las Sedas, Dist. Etna, Oaxaca, Mexico, *C. Conzatti* 1786, 19 May 1907 (US 474970-Type; NY).

*Tephrosia Conzattii* (Rydb.) Standl. Field Mus. Publ. Bot. **11**: 161. 1936.

Slender shrub, apparently reaching 3 m.; stems terete or angled, striate, the bark pale. Stems, axes of inflorescences, petioles, rachises and petioles densely hirsutulous to short-strigose with fine cinereous or rusty hairs. Leaves 6–20 cm. long, the petioles (3–)7–20 mm. long, most often shorter than the lowermost leaflets, the rachis 4.5–16 cm. long, striate; stipules linear, acuminate, to linear-setaceous, 6–14 mm. long, 1.5 mm. or less wide, persistent; leaflets of the principal leaves 15–35(–37), linear to linear-oblong or occasionally oblong, the base acute or obtuse, the apex acute, obtuse or rounded, cuspidate-mucronate, 12–37 mm. long, 2.5–7 mm. wide, (3–)5–7 times as long as broad, thin, glabrous to moderately short-strigose or strigose above, strigose beneath with cinereous or, along the midrib and margins, rusty hairs. Inflorescences borne singly in the axils of leaves, usually leafless (rarely one node with a leaf), straight, the lowermost first and best developed, ascending, (3–)5–30 cm. long, usually equaling or exceeding the leaves, the peduncle 1.5–8.5 cm. long; flowering nodes 6–25, the nodes somewhat buttressed below, the buds 5–7 at a node, 3–5 of these flowering and 1 or 2 fruiting. Primary bracts linear, acumi-



nate, often persistent in fruit (although often broken in herbarium-specimens), 6–13 mm. long, 1 mm. or less wide; secondary bracts inconspicuous, linear-subulate, deciduous. Pedicels 5–11 mm. long, ascending, slender. Dried flowers 14–16 mm. long. Calyx 4.5–5.5 mm. long, densely short-strigose with tawny or rusty hairs, the upper lobes acuminate, 1.5–2 mm. long, the lateral narrowly deltoid, acuminate, 2.5–3 mm. long, the lowermost subulate-lanceolate, 4 mm. long. Corolla apparently rose, becoming carmine with age, the standard brownish on the back with fine silky hairs, the blade with a green spot at the base within; blade of the banner ovate to obovate, 14 mm. high, 10–11 mm. broad, the claw 2–2.5 mm. long; wings 14 mm. long, ca. 3–4 mm. wide, with a claw 2–2.5 mm. long and a conspicuous auricle; keel shallow, ca. 15 mm. long, the claw ca. 2–3 mm. long. Vexillary stamen coherent with the staminal tube for about 1/3 of its length, free at the base, with or without an angular callosity near the base. Ovary strigillose along the upper suture, sometimes sparsely so along the lower, otherwise glabrous; ovules 9–11. Legume nearly straight or slightly sinuate, the outer half curving slightly upward, 4–6.5 cm. long, 4.5–5.5 mm. wide, spreading, ascending or drooping, with short, scattered hairs along the upper suture, otherwise glabrous; seeds (4–)7–11, oval-reniform, 3.4–3.8 mm. long, 2.2–2.6 mm. wide, brown variegated with black, plump. Somatic chromosomes 22.

DISTRIBUTION. Oak woods, 1400–2000 m., México, Guerrero and Oaxaca, Mexico. Map 4.

SPECIMENS EXAMINED. MEXICO. MÉXICO: Oak woods, Ypericones, Dist. Temascaltepec, *Hinton 6998*, 19 Nov. 1934 (F, GH, NY, US); barranca, Volcán, Dist. Temascaltepec, 1410 m., *Hinton 1297*, 9 Aug. 1932 (GH, MEXU, NY, US). GUERRERO: Steep bluff and open moist slope, open ridge with sparse cover of low second-growth oak on loose granitic-conglomerate soil, summit of mountains n.e. of Chilpancingo on road to Chilapa, 1800–1900 m., *Moore & Wood 4650*, 19 Aug. 1948 (GH, UC, Bailey Hortorium). OAXACA: Las Sedas, Dist. Etla, 2000 m., *Conzatti 1786*, 19 May 1907 (NY, US), *2520*, 29 Aug. 1909 (F).

The fifteen to thirty-five or thirty-seven narrow leaflets which are never broadest above the middle, the axillary inflorescences, the often persistent, linear bracts and the glabrous pods are characteristic. The species is most likely to be confused with *Tephrosia leiocarpa*, but is probably more closely related to *T. cuernavacana* which it resembles in its axillary inflorescences and glabrous legumes but from which it differs in bracts, leaflets and number of buds at a node of the inflorescence.

Although the leaflets of the Type are strigose above, the upper surfaces may be either glabrous or more or less strigose. The population studied near Chilpancingo, Guerrero, contains both forms, neither of which is associated with ecological differences.



In most specimens from the State of México the upper surfaces are glabrous. One plant of *Hinton 6998* (US), however, bears minute trichomes scattered on the upper surfaces.

7. ***Tephrosia cuernavacana*** (Rose) Macbr.

*Cracca cuernavacana* Rose, Contr. U. S. Nat. Herb. 12: 269. 1909. "Wooded slopes of barranca above Cuernavaca, 6000 feet," Morelos, Mexico, C. G. Pringle 6327, 25 June 1896 (US 461989-Type; CAS, GH, MEXU, NY, PH, UC, US).

*Tephrosia cuernavacana* (Rose) Macbr. Field Mus. Publ. Bot. 4: 87. 1925.

Erect suffrutescent perennial from a woody crown; stems simple or branched, monopodial, 6–10 dm. high, herbaceous or sometimes woody below. Stems, petioles, rachises and axes of inflorescences sparsely to densely strigillose to short-strigose or hirsutulous with whitish or rusty hairs. Principal leaves 5–13(–15) cm. long, spreading or ascending, the petiole 5–30 mm. long, longer or shorter than the lowermost leaflets, the rachis 4–11 cm. long; stipules linear to lanceolate, acuminate, 7–10(–13) mm. long, 1–2 mm. wide, persistent, green, ascending; leaflets of the principal leaves 13–29, oblong to elliptic-lanceolate, the apex rounded or somewhat truncate, with a slender mucro, the base rounded or obtuse; leaflets 14–32(–35) mm. long, 4–10(–11) mm. wide, 2–4 times as long as broad, thin, glabrous above, pale, thinly to moderately strigillose to strigose beneath with whitish hairs, the veins pale; petiolules 1–3 mm. long, slender. Inflorescences 2–5, terminating leafless axillary branches of either the main or secondary branches (the uppermost inflorescence sometimes apparently terminating the main axis but actually axillary and overtopping it), 3.5–9(–13) cm. long, ascending, usually exceeded by the leaves, the flowering nodes loosely grouped near the end, the peduncle 2–4(–7) cm. long, the flowering nodes 6–12, the lowermost rarely with a short, few-flowered branch in the axil of a bract; buds and flowers 2 at a node. Primary bracts lanceolate to ovate-lanceolate, acuminate, 7–15 mm. long, 2–5 mm. wide, about 7-veined, deciduous before anthesis, green and foliaceous; secondary bracts lanceolate to linear, 5–9 mm. long. Pedicels 4–7 mm. long, ascending, filiform, thickening somewhat in fruit, densely strigillose with brown hairs. Dried flowers 13–16 mm. long. Calyx 4–5 mm. long, densely strigillose to strigose with rusty-brown hairs, the lobes subulate, the upper 1.2–3 mm. long, the lateral 2.5–3.5 mm. long, the lowermost 3–4 mm. long. Corolla apparently white or pink, becoming pink, lavender or purplish, the banner with a green spot at the base of the blade; blade of the banner obovate to orbicular, 13–17 mm. high, 12–14 mm. wide, finely hairy on the back, the claw 2 mm. long; wings oblong, 14–15 mm. long, 3.5–4 mm. wide, slightly falcate with a distinct basal auricle, the claw 3.5–4 mm. long; keel 14–15 mm. long, the claw 2.5–3 mm. long. Staminal tube 9–10 mm. long, the vexillary stamen lightly adnate to the tube, occasionally coming free, flat, not thickened near the base. Ovary hirtellous along both sutures with rusty hairs, the valves



glabrous; ovules about 10. Legume nearly straight, about 4.5 cm. long, 5.5–6.5 mm. wide, spreading or ascending, hirtellous along the sutures or nearly glabrous, the valves glabrous, brown; seeds 4–9, the mature seeds not seen. Flowering collections from late June through August.

**DISTRIBUTION.** Well-drained soils in open oak or pine woods, 1200–1900 m., Morelos, Guerrero and Michoacán, Mexico. Map 4.

**SPECIMENS EXAMINED.** MEXICO. MORELOS: Wooded slopes of barranca above Cuernavaca, 6000 ft., *Pringle 6327* (CAS, GH, MEXU, NY, PH, UC, US). GUERRERO: Oak woods, Carrizeras, Dist. Mina, *Hinton 10485* (F, GH, MO, NY, US). MICHOACÁN: Woods, Puerto Zarzamora, Dist. Coalcomán, *Hinton 15051* (GH, US); open pine forests, rocky cliffs at Las Baranquillas, Apatzingán, 4000 ft., *Leavenworth & Hoogstraal 1789* (F); common in open, well-drained situations near falls 7 mi. s.w. of Uruapan, 6000 ft., *Leavenworth & Hoogstraal 1249* (F, MO); brownish-red clay loam, open pine woods on road from Tancítaro to Apatzingán, Municipalidad Tancítaro, 5000 ft., *Leavenworth 628* (F); steep slope under pines, just above Tacámbaro on highway to Pátzcuaro, 5500 ft., *Moore & Wood 4035* (GH, Bailey Hortorium), *4843* (GH, UC, Bailey Hortorium).

The combination of axillary inflorescences with two flower-buds at a node, lanceolate primary bracts and glabrous pods is quite unique. This species appears to be most closely allied to *Tephrosia Conzattii*.

As another example of the difficulties involved in pubescence-characters in this genus, it is interesting to note that both appressed and spreading pubescence is found on the stems of specimens from a single collection, *Hinton 15051*. Individuals of both types also occurred in the colony observed at Tacámbaro, Michoacán.

#### 8. *Tephrosia leucantha* HBK.

*Tephrosia leucantha* HBK. Nov. Gen. et Sp. (folio) **6**: 360. pl. 577. Aug. 1824; Op. cit. (quarto) **6**: 460. pl. 577. Sept. 1824. Near Guanajuato, Mexico, ca. 2000 m., *Humboldt & Bonpland*, Sept. 1803.

*Cracca leucantha* (HBK.) Kuntze, Rev. Gen. **1**. 175. 1891.

*Tephrosia leucantha* var. *acuta* M. E. Jones, Contr. West. Bot. **12**: 7. 1908. San Diego Canyon, Sierra Madre, Chihuahua, Mexico, 6400 ft., *M. E. Jones*, 16 Sept. 1903 (POM-Type; DS).

*Cracca Roseana* Rydb. N. Amer. Fl. **24**: 164. 1923. "Hacienda del Ciervo," between San Juan del Río and Cadereyta, Querétaro, Mexico, *Rose, Painter & Rose 9642*, 20 Aug. 1905 (NY-Type; GH, MEXU, US).

*Tephrosia Roseana* (Rydb.) Standl. Field Mus. Publ. Bot. **11**: 161. 1936.

Erect or somewhat decumbent herbaceous or suffrutescent perennial from a woody crown and thick woody roots up to 1 m. long; stems 3–6 dm. high, simple or with axillary branches up to 2.5 dm. long, these sometimes branching. Stems, petioles, rachises and axes of inflorescences



strigillose to hirsutulous with antrorsely directed white to rusty hairs. Leaves 6–15 cm. long, the petiole 4–25 mm. long, most often shorter than the lowermost leaflets, the rachis 6–11 cm. long; stipules linear, acuminate, 7–12 mm. or less long, 1 mm. or less wide, persistent; leaflets of the principal leaves 13–29, linear-oblong, oblong-lanceolate or oblong, the base rounded, the apex obtuse, mucronate, (9–)12–35 mm. long, (3–)4–10(–13) mm. wide, 3–5(–7) times as long as broad, the terminal leaflet equal to or smaller than the lateral; leaflets thin, dull, almost glabrous or (usually) thinly strigillose to hirsutulous above with whitish hairs, pale beneath and strigillose to hirsutulous, the hairs along the midrib sometimes rusty, the veins pale, the leaflets appearing canescent, often with whitish margins; petiolules slender, 1–2 mm. long, densely strigillose to hirsutulous with fine cinereous or rusty hairs. Inflorescences terminating the principal stems and axillary branches, 2–15 cm. long the peduncle 0.2–5 cm. long, sulcate, angled, the flowering nodes 6–15, crowded at first, the internodes elongating with age, the nodes prominent, buttressed below the pedicels; buds and flowers 2 at a node, the flowers opening from below, apparently both of a pair at the same time. Primary bracts lanceolate, acuminate, the base acute, (5–)6–12 mm. long, 2–4 mm. wide, ca. 7-nerved, usually deciduous at anthesis; secondary bracts 2–9 mm. long, 1 mm. or less wide, linear, acuminate, 3-veined. Pedicels 5–9 mm. long, ascending, slender, thickening in fruit. Dried flowers 13–16 mm. long. Calyx 3.5–5 mm. long, densely strigillose to hirsutulous with brown or rusty hairs, the lobes subulate (the lateral rarely narrowly triangular), the upper often almost completely fused together, 1–2.5 mm. long, the lateral (2–)3–5 mm. long, the lowermost (2–)3.5–6 mm. long. Corolla white, becoming rose-purple or violet, the banner with a greenish spot at the base, the petals brown in most dried specimens; blade of the banner obovate to orbicular, 12–14 mm. high and wide, finely hairy with rusty hairs on the back, the claw 3.5 mm. long; keel 15–16 mm. long, slightly auricled, the claw 2.5–3 mm. long. Staminal tube 12–13 mm. long, the vexillary stamen coherent with the tube for about 1/3 of its length, with a prominent 2–3-lobed callosity on the upper side near the base. Ovary densely strigillose or short-strigose with tawny or rusty hairs. Legume nearly straight, curving slightly upward near the end, 3.5–5.5 cm. long, about 5 mm. wide, spreading or drooping, densely hirsutulous, rarely strigillose, the hairs rusty or tawny, at least along the margins; seeds 7–9, reniform-oblong, brown to gray, variegated with black, 4–4.4 mm. long, 2.8–3.2 mm. broad.

**DISTRIBUTION.** Western and southern Chihuahua, western Tamaulipas, Zacatecas, Durango, Jalisco, Guanajuato and Querétaro, Mexico, apparently at 1500–1800 m. northward and 2000–2500 m. southward.

**SPECIMENS EXAMINED.** MEXICO. CHIHUAHUA: Guayanopa Cañon, Sierra Madre, Dist. Madera, 6000 ft., *M. E. Jones*, 1903 (MO); San Diego Cañon, Sierra Madre, Dist. Madera, 6400 ft., *M. E. Jones*, 1903 (DS, POM); Sierra Madre near Colonia Garcia, *Townsend & Barber* 367 (GH, MO, NY, US); 3 mi. south of Rubio, Cusihuiriac, *Shreve* 7985 (F, GH, US); rocky hills near Cusihuiriac, *Pringle* 2006 (MO, NY, PH, UC,



US); Guajochic, *Hartman 554* (GH, PENN, US). DURANGO: Tejamén, *Palmer 487*, 1906 (F, GH, NY, UC, US). ZACATECAS: Zacatecas, 7000 ft., *Kuntze 23410* (NY); Zacatecas, 7000–8000 ft., *Purpus*, Aug. 1903 (UC), rocky slopes, Dec. 1903 (UC); Zacatecas market, *Palmer 745*, 1898 (GH, US). JALISCO: On rocky slopes near Ojuelos, Lagos, 6500 ft., *Shreve 9300* (GH, PH, UC). GUANAJUATO: Guanajuato, *Dugès* (US); west-facing slope with dense oak woods on shaly soil between Valenciana and Santa Rosa, km. 11–12 on road from Guanajuato to Dolores Hidalgo, 8000 ft., *Moore & Wood 4790*, 29 Aug. 1948 (GH, UC, Bailey Hortorium). QUERÉTARO: Hacienda del Ciervo, *Rose, Painter & Rose 9642*, 20 Aug. 1905 (GH, MEXU, NY, US); Del Ciervo al cerro de la mesa, *Altamirano 1564*, 20 Aug. 1905 (MEXU, US). TAMAULIPAS: Tula, *Viereck 560*, June 1930 (US).

The specimens included here under *Tephrosia leucantha* are from widely scattered localities and show considerable variation. Those from the Sierra Madre of Chihuahua and the region of Cusihuiriacic are very much alike in appearance and the single flowering collection from this region has somewhat shorter and broader calyx-lobes and shorter bracts than other specimens examined. *Tephrosia leucantha* var. *acuta* M. E. Jones is referred here. Material from southern Chihuahua and Zacatecas is also very uniform, while that from Tejamén, Durango, is different in being very much branched, with the pubescence of the legume tightly appressed. The Jaliscan collection also has appressed pubescence and, in addition, very narrow leaflets only 3–4 mm. wide. The plant from Querétaro described as *Cracca Roseana* Rydb. has appressed pubescence and is not as rusty brown as some other plants, while the calyx-lobes are slightly longer than in most of the more northern examples. This plant differs from specimens from the type-locality of *Tephrosia leucantha* primarily in the denser, more tightly appressed, paler pubescence.

If a recognizable geographical trend is present in this species, it would appear to be toward shorter, broader, less attenuate calyx-lobes and shorter bracts in the northern portion of the range. Additional collections may, therefore, indicate the need for modification of *T. leucantha* in the sense here used. All of these plants, however, share in common the subulate calyx-lobes, lanceolate bracts, vexillary stamen with a thickening near the base and coherent with the staminal tube, terminal and axillary inflorescences with paired buds at each node, antrorse pubescence and tawny- or rusty-haired pods.



A Jones collection from Guayanopa Canyon, Sierra Madre, Chihuahua, 24 September 1903, made at the same time as the Type of *Tephrosia leucantha* var. *acuta*, is intermediate between *T. leucantha* and *T. leiocarpa*, also collected at this locality. It has the shrubby habit of the latter, an intermediate leaflet-shape, minutely strigillose leaflets and stems and strigillose legumes.

9. ***Tephrosia Thurberi*** (Rydb.) comb. nov.

*Cracca Thurberi* Rydb. N. Amer. Fl. **24**: 165. 1923. Mububi, Sonora, Mexico, *Thurber*, June 1851 (Distribution No. 410, in part) (NY-Type; MO, NY; GH-probable isotype).

*Tephrosia Thurberi* A. Gray, MS. in herb.; Rydb. in syn., N. Amer. Fl. **24**: 165. 1923.

Erect perennial herb 5–6 dm. high; stems 1–several from a woody crown, slightly woody at the base, monopodial, mostly simple or with one or several axillary branches. Stems, axes of inflorescences and pedicels doubly pubescent with rusty or pale hairs: both hirtellous with fine, strongly retrorse hairs and hirsutulous with coarser hairs which curve downward and outward; petioles and rachises hirtellous and hirsutulous with either retrorse or antrorse hairs. Principal leaves 10–17(–22) cm. long, the petiole 9–35(–40) mm. long, shorter or longer than the lowermost pair of leaflets, the rachis (4–)6–12.5(–16.5) cm. long; stipules linear, long-acuminate, to subulate, 10–12 mm. or less long, 1 mm. wide, becoming brown, usually persistent; leaflets of the principal leaves 9–31, mostly oblong to linear-oblong or elliptic, the base and apex rounded, rarely acutish, mucronate, 15–38(–43) mm. long, 6–12(–16) mm. wide, 2–3(–4) times as long as broad, hirtellous to hirsutulous above, hirsutulous to hirsute below; petiolules 1–2.5 mm. long, slender, densely hirsutulous. Inflorescences terminal or sometimes 1 (rarely more) axillary, 5–18 cm. long, erect, the flowers densely crowded at first, the internodes elongating during anthesis and in fruit, the flowering portion at anthesis 2–6(–10) cm. long, the flowering nodes usually 10–30, buttressed below; buds and flowers 2 at a node, anthesis proceeding centrifugally. Primary bracts linear to linear-lanceolate, acuminate, 7–13 mm. long, rarely more than 1.2 mm. wide, deciduous; secondary bracts linear-setaceous, 9 mm. or less long, deciduous. Pedicels 7–10(–11) mm. long, ascending, slender in flower, thickening in fruit, often with a setaceous bracteole. Dried flowers 14–18 mm. long. Calyx 5–6 mm. long, both hirtellous and hirsutulous to hirsute with rusty hairs, the lobes subulate, attenuate, with a broad U-shaped sinus between the upper and lateral lobes, the upper lobes 1.5–2 mm. long, the lateral 3–4 mm. long, the lowermost ca. 5 mm. long. Corolla apparently white, becoming lavender or purplish, the base of the blade of the banner with a green spot; blade of the banner oval to obovate or orbicular, 13–16 mm. high, 11–15 mm. broad, the apex retuse, densely silky-hirsutulous with brown hairs on the back, the claw ca. 3 mm. long; wings 14–16 mm. long, with an acute auricle, the claw 4–5 mm. long; keel



14–15 mm. long with a claw 3–3.5 mm. long. Vexillary stamen with a prominent 2-lobed callosity on the upper side near the base. Ovary densely hirsutulous. Legume nearly straight, 3–6 cm. long, 3.5–4.5 mm. wide, spreading, densely hirsutulous with rusty hairs; seeds 5–10, mature seeds not seen. Flowering collections from late May and June (Thurber) but primarily from late July to early September.

DISTRIBUTION. Oak and pine woods, mostly between 1300 and 1900 m., southern Arizona, northern Sonora, and southwestern Chihuahua. Map 16.

SPECIMENS EXAMINED. UNITED STATES. ARIZONA. Southern Arizona, 1881 (GH). Pima Co.: near Tucson, *Bottimer 306* (US). Pima or Santa Cruz Co.: Santa Rita Mts., 4500 ft., *M. E. Jones*, 1903 (MO), *Pringle*, 1884 (CAS, F, GH, MO, NY, PENN, PH, POM, US). Santa Cruz Co.: Sonoita Valley, 6500 ft., *Rothrock 625* (F, GH, PH, US); Patagonia Mts., *Peebles, Harrison & Kearney 5597* (US), *Kearney & Peebles 10190* (UC, US). Cochise Co.: Ruckey Valley, south peaks of Chiricahua Mts., 9–10000 ft., *Lemmon*, 1881 (F); Ft. Huachuca, *Wilcox*, 1893 (NY), 1894 (NY); Huachuca Mts., *Harrison & Kearney 5792* (US), *Holzner 1732* (US); Huachuca Mts., 6000 ft., *M. E. Jones*, 1903 (POM, UC), 5500 ft., 1903 (US); Miller Canyon, Huachuca Mts., *M. E. Jones*, 1929 (CAS, GH, POM); Ramsey Canyon, Huachuca Mts., *M. E. Jones*, 1929 (MO, NY); open hill tops, Ramsey Canyon, Huachuca Mts., *Gooding 751* (NY, US).

MEXICO. SONORA: Mububi, *Thurber 410* (part) (MO, NY); between Fronterus and Mububi, *Thurber 410* (part) (GH); Bubacomori (Babocomari?), *Thurber 1009* (GH, NY); between Barbocomori and Santa Cruz, *Wright 964* (GH, MO, NY, PH, UC, US); Sierra Verde, *Schott*, Aug. 1855 (F, NY, US); Cerro del Capulin, n.w. of Aribabi, loop of the Río Bavispe, 6100 ft., *White 2706* (GH, US); Cañon Internacional, region of the Río Bavispe, *White 3502* (GH); pineland burned over June 1939, Puerto de los Aserraderos, region of the Río Bavispe, *White 3225* (GH, SMU) (For exact locations, see *White* (1948)). CHIHUAHUA: Mojarachic, *Knobloch 5576* (F); open pine slope, Sierra Charuco, Río Fuerte, *Gentry 2314* (F, GH, MEXU, MO, UC, US) (see *Gentry* (1942) for map.).

The narrow, linear to linear-lanceolate acuminate primary bracts (rarely more than 1.2 mm. wide) contrast strikingly with the lanceolate acuminate primary bracts (2–3 mm. wide) of *Tephrosia leucantha*, with which this species has been identified. An additional striking character is supplied by the pubescence of the stems, axes of the inflorescences and pedicels, which in *T. Thurberi* are both hirtellous with strongly retrorse hairs and hirsutulous with coarser hairs which curve downward and outward. In *T. leucantha*, however, the same parts are strigillose to hirsutulous with antrorsely directed trichomes. Since the primary bracts of both species are deciduous at anthesis or soon



thereafter, the very different induments make possible the accurate identification of fruiting specimens. The more westerly and northerly range of *T. Thurberi* is also noteworthy.

Rydberg designated as cotypes both flowering and fruiting specimens (NY). The flowering specimen which clearly shows the narrow bracts should stand as the Type. Unfortunately the plants distributed as *Thurber 410* comprise several collections made in May and June, 1851, at Fronterus, Mububi or intermediate localities in Sonora so that some of the specimens bearing this number do not represent the type-collection, although they are this species and are perfectly characteristic.

#### 10. *Tephrosia virginiana* (L.) Pers.

*Cicer Astragaloides* (forte) *Virginianum*, hirsutie pubescens, floribus amplis, subrubentibus, Pluk. Phytogeogr. pl. 23, fig. 2. 1692; Almagest. 103. 1696.

*Vicia foliis pinnatis abruptis* Gronov. Fl. Virgin. 83. 1743; ed. 2, 106. 1762.

*Cracca virginiana* L. Sp. Pl. 2: 752. 1753, as to syn. Pluk. Almagest. and Herb. L. (GH-photograph of Type: *Galega*, Sheet 4, in Herb. L.)

*Galega virginiana* L. Syst. Nat. ed. 10. 2: 1172. 1759, as to name, not plant.

*Galega virginica* J. F. Gmel. Syst. Nat. 1552 (index). 1791.

*Tephrosia virginiana* (L.) Pers. Syn. Pl. 2: 329. 1807.

*Tephrosia virginica* (L.) Bigel. Fl. Bost. ed. 2. 278. 1824.

*Tephrosia holosericea* Nutt. Jour. Acad. Phila. 7: 105. 1834. "In the plains of Arkansas." (PH-specimen marked "*Tephrosia \*holosericea* Nutt. Arkansas (T. Nuttall)" and a fragment, apparently part of the same plant, marked "Arkansas, Dr. Pitcher.")

*Tephrosia virginiana*  $\gamma$  *holosericea* (Nutt.) T. & G. Fl. N. Amer. 1: 296. 1838.

*Cracca virginiana holosericea* (Nutt.) Vail, Bull. Torr. Cl. 22: 27. 1895.

*Cracca holosericea* (Nutt.) Britt. & Bak. Jour. Bot. 3: 16. 1900.

*Tephrosia virginiana*  $\beta$  *glabra* Nutt. ex T. & G. Fl. N. Amer. 1: 296. 1838. "Georgia, Nuttall."

*Cracca latidens* Small, Fl. Southeastern U. S. 609, 1331. 1903. Vicinity of Eustis, Lake County, Florida, *G. V. Nash 1072*, 16-30 June 1894 (NY-Type; GH, MO, NY, PH, UC, US).

*Tephrosia latidens* (Small) Standl. Field Mus. Publ. Bot. 11: 161. 1936.

*Cracca leucosericea* Rydb. N. Amer. Fl. 24: 163. 1923. On the Washita, between Fort Cobb and Fort Arbuckle, *E. Palmer 114*, 1868 (NY-Type; NY, US).

*Tephrosia leucosericea* (Rydb.) Cory, RHODORA 38: 406. 1936.

*Cracca Mohrii* Rydb. N. Amer. Fl. 24: 163. 1923. Near Eucheeana, Walton County, Florida, *C. Mohr*, June 1880 (US 773335-Type; US).



Erect perennial herb from a branched woody crown and long slender tough woody roots; stems one to several from each branch of the crown, (2-)3-7 dm. high, monopodial, sometimes with weak axillary branches up to 17 cm. long, nearly terete or obtusely angled. Stems, petioles and rachises sparsely to densely strigillose, strigose, hirtellous, hirsute or villous with fine cinereous or whitish hairs. Leaves 5-14 cm. long, ascending, the petioles principally 1-6(-9) mm. long, those of the lower leaves sometimes 9-12 mm. long, shorter than the lowermost leaflets; lower stipules oblanceolate to linear, the upper linear-lanceolate to subulate, 8-11 mm. or less long, becoming brown, often deciduous; leaflets of the principal leaves 9-31 (or in some plants of northern Florida -39), predominantly 15-25, elliptic to linear-oblong, the base and apex rounded to acute, mucronate, 11-31(-33) mm. long, (2-)4-8(-10) mm. wide, 2-7 times as long as broad, the terminal leaflet often smaller than the lateral and somewhat cuneate or retuse; leaflets dull, thin, bluish- to yellowish-green, glabrous or sparsely to densely strigillose to densely hirsutulous above, sparsely to densely strigillose or hirtellous to hirsute below with fine white or cinereous hairs, appearing woolly or silky, the veins often reddish below; petiolules 0.5-1.5 mm. long. Inflorescences terminating the principal axes (or axillary branches sometimes with a few flowers), either very short-peduncled or the lower 1-6 flowering nodes with leaves, the flowering nodes 7-20 or more, often crowded and buttressed below; buds 2(-3) at a node, of these 2 or very rarely 3 flowering and fruiting, anthesis proceeding centrifugally, the inflorescence elongating in fruit. Primary bracts linear-lanceolate, long-acuminate, to subulate, 8-13 mm. long, 0.5-1.7 mm. wide, often with 1 or 2 teeth, deciduous at anthesis; secondary bracts linear-subulate, 4-6 mm. long, deciduous. Pedicels 4-17(-20) mm. long, ascending, slender, thickening in fruit, sometimes bearing 1-3 bracteoles. Dried flowers 14-21 mm. long. Calyx (4-)5-10 mm. long, strigillose to densely strigose or hirtellous to densely hirsute with long soft spreading hairs, the upper lobes lance-subulate to narrowly deltoid, short to long-acuminate, (2-)3-5(-6) mm. long, the lateral lobes ovate to lanceolate, short- to long-acuminate, (3-)4-6.5 mm. long, the lowermost ovate to lanceolate, short- to long-acuminate, (2-)4-7.5 mm. long. Corolla usually bicolored, the banner lemon-yellow to cream-colored without, cream to white within, the wings and keel rose, rarely white, the petals often brown in dried specimens; banner with an abrupt, short claw or the blade tapering into a claw about 3 mm. long, the blade orbicular to broadly ovate, 14-19 mm. high and broad, finely strigillose or hirtellous on the back; wings 15-20 mm. long, auricled, the claw 2-3 mm. long; keel 14-15 mm. long, nearly semi-circular, with or without an auricle, the claw 2-3 mm. long. Vexillary stamen coherent with the staminal tube for about 1/3 of its length, often bent near the base, sometimes broadened and thickened, the staminal tube 10-13 mm. long. Ovary densely strigillose to strigose with fine cinereous hairs; ovules 8-11. Legume straight to slightly downwardly falcate, (2.5-)3.5-5.5 cm. long, (3.5-)4-5.5 mm. wide, horizontal or ascending, stramineous to dark brown, sparsely strigillose to densely strigose or



hirtellous to densely hirsute or villous with long, soft, white or cinereous hairs; seeds 6–11, bean-shaped, oblong to subreniform in outline, 3.2–4.2 mm. long, brown, variegated with black. Somatic chromosomes 22. Flowering collections principally from mid-April through May at the southern edge of the range and from late June through July in the north.

**DISTRIBUTION.** Well-drained, open, circumneutral to acid, non-calcareous soils in oak or pine woods, on ridges and prairies from Hillsborough County, New Hampshire, south to Hernando, Lake and Orange Counties, Florida, westward to St. Croix County, Wisconsin, Kiowa County, Kansas and Bailey and DeWitt Counties, Texas, United States; also in extreme southern Ontario, Canada. Map 7.

**SPECIMENS EXAMINED.** Approximately 1000 specimens of this species have been examined. Since *Tephrosia virginiana* cannot be confused with any other species of the genus in the United States, for most part only specimens to indicate the northern and western edges of the range are cited. All of the collections from Florida, Alabama, Mississippi and Louisiana are cited, however, because of the relatively small amount of material from these areas and the consequent desirability of bringing these records together in one place.

**CANADA.** ONTARIO. Norfolk Co.: Normandale, *Frs. Victorin, Germain & Dominique 46865* (GH); St. Williams, *Frs. Victorin & Germain & E. Jacques 45867* (GH).

**UNITED STATES.** NEW HAMPSHIRE. Hillsboro Co.: Merrimack, *Batchelder, 1918* (F); Nashua, *Robinson 778* (GH); Manchester, *Provost, 1935* (NY). MASSACHUSETTS. Middlesex Co.: Lowell, *Beattie, 1927* (OKL, POM). Franklin Co.: Sunderland, *Seymour 3421* (DUKE). NEW YORK. Albany Co.: Londonville, *House 21577* (DUKE, GH, NY, US). Broome Co.: Chenang River, Port Crane, *Millspaugh* (F). Seneca Co.: Junius, *Wiegand & Manning 16658* (MO). OHIO. Erie Co.: Oxford, *Moseley, 1903* (F); Castalia cemetery, *Moseley, 1896* (US). Lucas Co.: *Pontius & Bartley, 1934* (US). Wood Co.: Liberty Twp., *Shanks, 1939* (NY). MICHIGAN. Kent Co.: Grand Rapids, *Shaddick, 1895* (US), *Rush, 1935* (NY). Livingston Co.: Hamburg, *Ehlers 6026* (UC); Buck Lake, *Ehlers 1487* (GH). Muskegon Co.: Muskegon, *Anderson, 1939* (MO). Washtenaw Co.: Pickerel Lake, Dexter Twp., *McVaugh 7579* (GH). WISCONSIN. Portage Co.: Plover, *Schuette, 1888* (F, US). Rock Co.: Beloit, *Wadmond 16034* (KY). Trempeleau Co.: Trempeleau, *Fassett 4371* (DUKE). MINNESOTA. Without locality, *Holzinger, 1890* (US). Winona Co.: Winona, *Hasse, 1882* (NY).

IOWA. Allamakee Co.: 7 mi. south of New Albin, *Hayden 10306* (ISC). Buchanan Co.: Rowley, *Pammell, 1902* (ISC). Johnson Co.: Iowa City, *Hitchcock, 1889* (F, KSA); n.w. of Oxford, *Shimek, 1923* (WVA). Lee Co.: Sec. 28, T67N R5W, *Fults, 1931* (ISC). Muscatine Co.: Muscatine, *Tolstead, 1934* (UC). MISSOURI. Jackson Co.: Sheffield, *Bush 5846A* (GH). Johnson Co.: Warrenburg, *Steyermark 24592* (F, MO). Lewis Co.: LaBelle, *Steyermark 25732* (F). Macon Co.: Elmer, *Steyermark 40556* (MO). Putnam Co.: Livonia and Unionville, *E. J. Palmer 41101*



(MO). KANSAS. Barton Co.: *Imler & Rydberg 1304* (KSA). Clay Co.: Clay Center, *C. Weber 146* (KSA). Cloud Co.: *S. Fraser, 1930* (KSA). Douglas Co.: *Hitchcock, 1899* (KSA). Ellsworth Co.: *Carneiro, Bondy 390* (FLAS, OKL); *Kanopolis, Becker, 1896* (KSA). Kiowa Co.: *Greensburg, B. Smyth 2117* (KSA). Pottawatomie Co.: *St. George, Carleton & Reed, 1893* (KSA). Stafford Co.: near St. John, *Maupin, 1934* (KSA).

OKLAHOMA. Beckham Co.: *Sayre, Hart 56* (OKL). Comanche Co.: Ft. Sill, *Clements 11636* (GH); *Wichita Mts., McMurry 690* (OKL). Roger Mills Co.: *J. Engelman 1597* (OKL). Woodward Co.: *Mooreland, M. Rogers 251* (OKL); *Hyde, 1944* (OKL). TEXAS. Bailey Co.: *Coyote Lake, Ferris & Duncan 3474* (DS). Callahan Co.: *Clyde, E. J. Palmer 13823* (TENN). Comanche Co.: *Comyn* (TEX). Dewitt Co.: western part, *Riedel, 1942* (TEX). Erath Co.: mi. north of Morgan, *Tharp, 1941* (GH); *L. Gough, 1921* (TEX). Guadalupe Co.: *Sullivan, E. J. Palmer 11655* (GH); 13 mi. south of Seguin, *Erlanson 108* (GH), *106* (US). Lamb Co.: 8 mi. south of Olton, *Cory 13506* (GH). Lubbock Co.: *Lubbock, Whitehouse, 1929* (TEX), *Reed 3051* (US). Montague Co.: *Tharp 2897* (TEX, US).

LOUISIANA. Natchitoches Parish: *Natchitoches, E. J. Palmer 8016* DS, MO, US). Rapides Parish: 25 mi. south of Alexandria, *Erlanson 134* (US); 7 mi. west of Woodworth, *D. & H. Correll 9713* (DUKE). MISSISSIPPI. Attala Co.: west of Kosciusko, *C. A. & U. Weatherby 6293* (GH, NY, PENN, US). Clarke Co.: *Enterprise, Tracy 3298* (NY). Forrest Co.: *Hattiesburg, Drushel 8407* (MO). Harrison Co.: *Woodson & Anderson 1580* (MO). Jones Co.: *Laurel, Tracy 3351* (NY). Pearl River Co.: 10 mi. west of Poplarville, *Erlanson 161, 162* (US).

ALABAMA. Cullman Co.: *Cullman, Sudworth, 1891* (US). Jackson Co.: *Bryant, Porter, 1934* (GH); *Racoon (Sand) Mt., Wherry, 1933* (PENN). Jefferson Co.: *Birmingham, Moore L6* (MO). Lee Co.: *Auburn, Earle & Baker, 1897* (F, MO, NY, US). Macon Co.: *Tuskegee, Drushel, 1915* (MO). Marshall Co.: *Guntersville, Howell 815* (US). Mobile Co.: *Mobile, Mohr, 1892* (US); 18 mi. north of Mobile, *Erlanson 186, 192* (US); 2 mi. north of Citronella, *Erlanson 198* (DUKE). Montgomery Co.: 1 mi. west of Maxwell Field, *Montgomery, Edwards, 1932* (PENN). Shelby Co.: *Calera, Everts* (PH).

FLORIDA. Clay Co.: 3 mi. south of Green Cove Springs, *Wood & Clement 7162* (GH); *Blanton 6330* (US); 0.5 mi. east of Penny Farms *Erlanson 273a* (US); *Goldhead Branch State Park, Murrill* (FLAS). Duval Co.: 8 mi. s.w. of Jacksonville, *Kime, 1943* (FLAS). Gadsden Co.: *Chattahoochee, Knight, 1942* (FLAS); 2 mi. east of Chatahoochee, *Erlanson 235, 235a* (US). Hernando Co.: *Buswell, 1928* (MIAMI). Jefferson Co.: *Monticello, Nolan, 1928* (FLAS). Lake Co.: *Eustis, Hitchcock, 1894* (FLAS), *Nash 1072* (GH, MO, NY, PH, US). Leon Co.: *Kurz, 1942* (FLAS). Liberty Co.: near Aspalaga, *Wherry, 1930* (PENN). Marion Co.: *Wiersdale, West, 1928* (FLAS); 1 mi. south of Oklawaha, *Erlanson 252* (US). Okaloosa Co.: *Choctawatchee Forest, Crestview,*



*Knight*, 1939 (FLAS); 6 mi. north of Ft. Walton, *Erlanson* 219 (US), 220a (GH, US). Orange Co.: 10 mi. n.e. of Orlando, *Blanton* 6422 (CAS, DS, GH). Putnam Co.: Putnam Hall, *West & Arnold*, 1942 (FLAS); north of Palatka, *J. Davis*, 1933 (FLAS). Walton Co.: *Morrison*, 1933 (FLAS).

Although *Tephrosia virginiana* is easily distinguishable from the other species occurring in the United States, it is rather variable, particularly with respect to the number and length of the trichomes of the indument, their distribution and appressed or spreading character. A second variable feature is the calyx, the lobes of which are rather inconstant in both shape and length. Since both of these characters, as well as leaflet-shape, have been used as specific and varietal criteria, considerable time has been spent in an attempt to determine what importance may be assigned to these features of the plant.

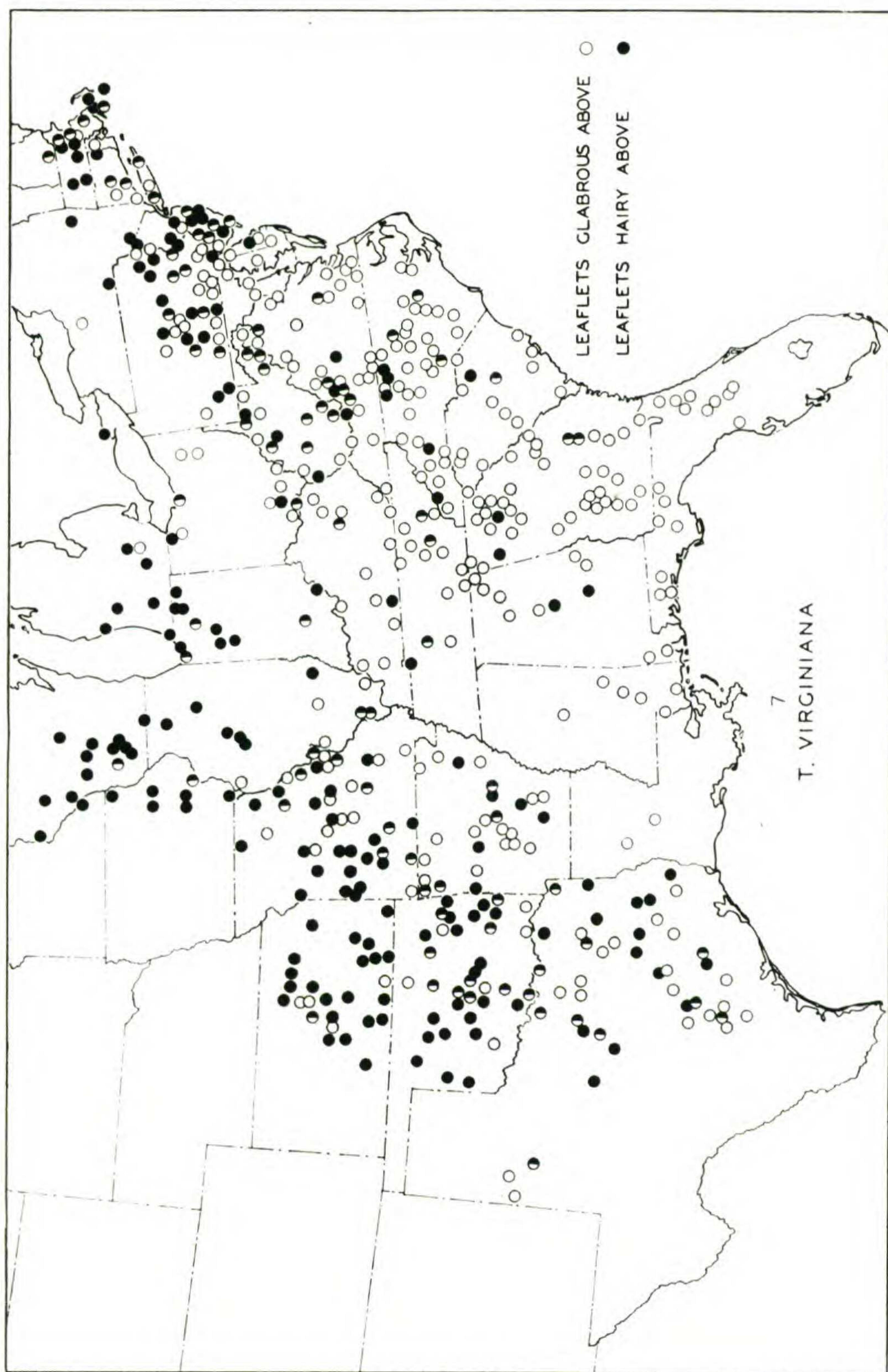
Almost every possible gradation of hairiness, from few, evenly scattered trichomes to densely crowded trichomes, is encountered within the range of the species. It is quite impossible to delimit any of these phases, other than arbitrarily. No definite segregation of any type can be found. Similarly, the trichomes form a complete series from two-tenths to more than two millimeters long. There appears to be a general tendency for increasing length of hairs from south to north, but many exceptions occur.

In contrast to degrees of pubescence, the presence or absence of hairs on the upper surfaces of the leaflets is usually a clearly defined character. A few intermediates are found but, for the most part, the distinction is rather sharp with the leaflets either glabrous or with various densities of evenly distributed trichomes on the upper surfaces.<sup>1</sup> Both forms very often occur within the same colony and, indeed, are often represented on the same herbarium-sheet. Proportions of "hairy" and "glabrous" plants vary from colony to colony within any given area, seemingly to a large degree by chance. A few mass-collections made in the summers of 1947 and 1948 seem to bear this out.

It will, in addition, be noted from Map 7 that in herbarium-collections there is no real geographic segregation of either type, although more plants with glabrous leaflets are represented in the

<sup>1</sup> This separation into two types may, of course, be arbitrary, since the mode of inheritance of pubescence-characters and the effect of environment are unknown. A whole series of types may be involved, but it appears to be impossible to set up other distinctions at the present time.





Map 7. Distribution of *TEPHROSIA VIRGINIANA*. Half-filled circles indicate localities or collections from which both glabrous and hairy forms are known. See accompanying text.



southeastern area than elsewhere, while in the northwestern part of the range nearly all of the collections consist of hairy plants. Even though herbarium-specimens probably are not good samples of the populations involved, it seems reasonable on the basis of this material to postulate clines of increasing numbers of hairy

Mass Collections of *Tephrosia virginiana*

Locality	Plants with upper surfaces of leaflets glabrous*		Plants with upper surfaces of leaflets hairy*	
Botetourt Co., Va.....	15	(67.5)	7	(32.5)
Roanoke Co., Va.....	40	(100)	0	(0)
Montgomery Co., Va.....	57	(83.7)	11	(16.1)
Wayne Co., N. C.....	22	(95.3)	1	(4.4)
Richmond Co., Ga.....	101	(100)	0	(0)
Emanuel Co., Ga.....	58	(54)	48	(46)
Roane Co., Tenn.....	70	(45.7)	83	(54.3)
Dickson Co., Tenn.....	83	(76.2)	26	(23.8)
Prairie Co., Ark.....	46	(40.4)	68	(59.6)
Gurdon Co., Ark.....	8	(100)	0	(0)
Bowie Co., Tex.....	7	(18)	32	(82)

\* Figures in parentheses are percentage of either type.

plants from the Southeast, northward and westward, with local variations from one colony to another due to the fixation of either type. There is not, however, sufficient segregation of either glabrous or hairy forms to warrant taxonomic recognition of either entity on a geographical basis.

As in *Tephrosia onobrychoides*, *T. hispidula* and *T. florida*, the hairs on the leaflets may be either spreading or appressed. In this species, however, the distinction is often difficult to make with any degree of certainty although in the above-mentioned species the differences are very conspicuous. There are in *Tephrosia virginiana*, in addition, indications of an ecological influence, as well as that of the plant-press. On a single plant, the lower parts, which presumably develop during the cooler days of the growing season, often show spreading pubescence, while the upper portions bear distinctly appressed hairs. This is particularly evident in the more inland collections. In general, the northern specimens bear spreading pubescence while the southern plants have more appressed hairs. There appears, nevertheless, to be no definite segregation of either type. In the absence of other data it does not seem that much importance can be attached to this feature.



With this discussion as a background, the segregates from *Tephrosia virginiana* are considered below:

The name, *Tephrosia virginiana* var. *glabra* Nutt. ex T. & G., (described as "leaflets nearly glabrous when old"), has been applied to plants with very short and tightly appressed trichomes and to glabrous or glabrate plants (Fernald 1943, p. 452). However, no individuals with the stems, rachises or lower surfaces of the leaflets glabrous are represented in the numerous specimens examined, although many are indeed sparsely strigillose and by late summer the relatively long hairs of some plants may be broken off. This variety has been limited to the southeastern Coastal Plain, where thinly strigillose plants do occur. Plants with longer hairs, however, are also found there, while others which differ only in the greater density of the indument occur in Texas and Oklahoma. There is neither a morphological nor a geographical break.

*Tephrosia virginiana* var. *holosericea* (Nutt.) T. & G. has been restricted by some authors (Torrey & Gray 1838; Fernald 1943) to specimens in which the leaflets are "very silky pubescent on both sides". Fassett (1939) and Deam (1940), however, concluded that it is quite impossible to determine where the line between this and the typical form should be drawn and have applied this name to plants with the upper surfaces of the leaflets hairy, while restricting the typical form to those with the upper surfaces glabrous. This application seems to be quite justified, although, as pointed out above, there does not seem to be sufficient segregation of either type to warrant retention of this variety.

*Tephrosia leucosericea* (Rydb.) Cory supposedly is distinguished by the appressed, silky pubescence of leaflets, calyx and legume and by the ovate-lanceolate, short-acuminate calyx-lobes. According to Rydberg the range is from Kansas to Texas. Although some specimens from this region are strikingly silky with tightly appressed hairs, they differ only in degree of pubescence from plants scattered over much of the southern half of the range of *Tephrosia virginiana*, as far north as New Jersey. Plants with appressed pubescence may occur either alone or with individuals with spreading pubescence. Although the original description indicated that the upper surfaces of the leaflets are glabrous or glabrate, the type-sheet also has portions of a hairy plant. The



calyx-lobes are well within the ordinary range of variation exhibited by *Tephrosia virginiana* and are by no means confined to plants with appressed pubescence, nor are they found in all specimens with such pubescence.

Still another segregate, *Cracca latidens* Small, from Lake County, Florida, combines in one plant short, ovate, abruptly acuminate calyx-lobes with leaves bearing as many as 39 broadly oblong leaflets. Unfortunately, these characters appear to have occurred together only at the type-locality. Although the calyx-lobes of these plants are the shortest of any of the specimens seen, the difference is one of degree only, for such calyx-lobes occur sporadically and are neither limited to Florida nor encountered in many Florida plants. There does seem to be a tendency toward an increase in leaflet-number in northern Florida but this, as well as the shape of the leaflets is quite inconstant.

*Cracca Mohrii* Rydb. is the other combination of oblong leaflets, acute at either end, with "ovate-lanceolate calyx lobes, 2.5 mm. long." The Type is a fruiting specimen with a single shoot bearing a few out-of-season flowers which are smaller than usual and consequently with shorter calyx-lobes. The plant is little more than a freak and deserves no recognition whatsoever.

*Tephrosia virginiana* seems, therefore, to be a single, widespread, genetically diverse species, lacking in both distinct morphological and geographical variations, although there appears to be a general tendency toward longer and more spreading, somewhat denser pubescence in the northwestern portion of the range and in the opposite direction in the southeastern part.<sup>1</sup> The segregation of specific or varietal entities on any of the grounds discussed above seemingly can be achieved only artificially.

The typification of the species was fully discussed by Britten and Baker (1900), who concluded that the name *Cracca virginiana* L., based on a mixture of two species, was properly applied to

<sup>1</sup> Evidence has been accumulated showing that the variability in the production of rotenone by individuals of this species is genetically controlled (Little 1942). Although large areas lack rotenone-producing plants, the geographical trend in this physiological characteristic is toward greater production of rotenone in the southern portion of the range. The areas of rotenone production are, however, widely scattered (Florida, Georgia, Louisiana, Texas and Oklahoma). (See data and map in Sievers, Russell, et al. 1938, also brief discussion under ECONOMIC IMPORTANCE in the present paper.)



*Tephrosia spicata* (Walt.) T. & G., while the plant known for 150 years as *Tephrosia virginiana* (L.) Pers. then took the next oldest name, *T. holosericea* Nutt., the basis of the combination, *Cracca holosericea* (Nutt.) Britten & Bak. Robinson subsequently pointed out (Britten & Baker 1900a), however, that since Walter (1788, p. 188) in describing *Galega spicata* had clearly removed the confusing element, while retaining the Linnaean name for the plant figured by Plukenet, there was no cause for the change in typification. Walter has been followed consistently by everyone, including Britten and Baker who, after Robinson's note, recanted. Under the provisions of Article 52, International Rules of Botanical Nomenclature, ed. 3, Walter's restriction of the name is fully justified. In addition, the specimen in the Linnaean Herbarium (*Galega*, Sheet 4), annotated by Linnaeus, is this species as usually understood. Fassett (1939, p. 59) has also discussed the fixation of the Type, and has concluded that the concept of Torrey and Gray in *Flora of North America* 1:296. 1838, which is consistent with the Linnaean specimen, had best be retained. The typical form is the common eastern plant with the upper surfaces of the leaves glabrous.

#### 11. *Tephrosia onobrychoides* Nutt.

*Tephrosia onobrychoides* Nutt. Jour. Acad. Phila. 7: 104. 1834. "In the plains of Arkansas." (PH—two authentic specimens: the first marked "T. \*onobrychoides Nutt. Arkansas. Dr. Pitcher," and the second marked "T. onobrychoides (Nutt.) Arkansas." Both have spreading pubescence; in the second, the upper surfaces of the leaflets are glabrous. The first specimen may be taken as the Type. NY—a specimen marked in Torrey's hand, "*Tephrosia pauciflora* Nutt. Gen. 'badly described.' Given to me under this name by Nuttall in 1822, but evidently his *T. onobrychoides*. Arkansas. Nuttall.")

*Cracca onobrychoides* (Nutt.) Kuntze, Rev. Gen. 1: 175. 1891, as *onobrycodes*.

*Tephrosia multiflora* Featherm. Rep. Bot. Surv. South & Cent. La. 73. 1871 in Ann. Rep. Board Supervisors La. State Univ. 1870, not Blatter & Halb. 1918. "Pine barrens of Ponchatoula," Tangipahoa Parish, Louisiana (GH).

*Tephrosia angustifolia* Featherm. Op. cit. 73. 1871. "Pine barrens near Ponchatoula," Tangipahoa Parish, Louisiana (GH-watercolor of the presumed Type).

*Cracca angustifolia* (Featherm.) Pennell, Bull. Torr. Cl. 44: 337. 1917.  
*Cracca texana* Rydb. N. Amer. Fl. 24: 176. 1923. "Prairies at Hemp-



stead," Waller County, Texas, *Elihu Hall 119*, 1 June 1872 (NY-Type; F, GH, MO, NY, POM, US).

*Tephrosia onobrychoides* var. *texana* (Rydb.) Macbr. Field Mus. Publ. Bot. 4: 193. 1929.

*Tephrosia texana* (Rydb.) Cory, RHODORA 38: 406. 1936.

Erect or occasionally decumbent perennial herb from a stout, woody crown and woody tap-root; stems stout, terete, to 6 dm. high (exclusive of inflorescence), sometimes 5 mm. in diameter, branching monopodially or sympodially, the branches ascending or decumbent. Stems, petioles, rachises and petiolules strigillose or hirtellous to strigose or hirsute with cinereous to rusty hairs. Principal leaves 8–22 cm. long, the petioles 7–35 mm. long, exceeded by the lowermost leaflets; stipules linear-lanceolate to linear, acuminate, the lowermost 5–17 mm. long, the upper smaller, persistent, becoming brown; leaflets of the principal leaves (11–)13–25 (rarely –29), linear-oblongate or narrowly elliptic to oblong-elliptic or elliptic-cuneate, the apex obtuse, rounded or truncate, emarginate, mucronate, 17–55 (–60) mm. long, 4–16 (–20) mm. wide, 2.5–6 times as long as broad, thin, dull, glabrous to strigillose or hirtellous to hirsutulous above, strigillose to short-strigose or hirtellous to hirsutulous (or hirsute along the midrib) with cinereous to somewhat rusty hairs below; petiolules 1–2.5 mm. long. Inflorescences terminal or axillary, usually much exceeding the leaves, 1.4–8 dm. long, stout, leafless, terete below, angled above, with 10 to ca. 40 flowering nodes which may be crowded in 2's or 3's; buds 5–6 at a node, 3–5 of these flowering, 1–3 fruiting. Primary bracts linear-lanceolate to linear-setaceous, the lowermost 5–12 mm. long, those above smaller, often deciduous; secondary bracts smaller, 6 mm. or less long, linear-setaceous, deciduous. Pedicels ascending, 4–10 mm. long, filiform in flower, becoming stout in fruit. Calyx 4–5 mm. long, with a double indument, hirtellous and sparsely to densely hirsutulous or hirsute with cinereous or (on the lobes) rusty hairs, the lobes short, deltoid-acuminate, the upper 1–2.5 mm. long, the lateral 2.5–3 mm. long, the lowermost 3–4 (–5) mm. long. Dried flowers 15–20 mm. long. Corolla white becoming crimson in age, pink or purple upon drying; blade of the banner nearly orbicular to ovate, retuse, 12–18 mm. high, 12–16 mm. broad, the claw 3.5 mm. long; wings ca. 19 mm. long, with a small auricle, the claw 4.5 mm. long; keel shallow, 15–17 mm. long, auricled, the claw ca. 4.5 mm. long. Staminal tube generally 14–15 mm. long, the vexillary stamen free only at the base, contracted at the base, flat on the upper surface. Ovary densely strigillose or hirtellous; ovules 10–11. Legume straight or the proximal half slightly curved downward, 3.5–5.8 cm. long, (3.5–)4.5–5 mm. wide, ascending or spreading, strigillose or hirtellous with cinereous hairs; seeds 3–10, narrowly reniform, oblong or subquadrate in outline, the ends flattened through crowding, 3.4–5 mm. long, 2.5–3 mm. wide, mottled with black, smooth. Somatic chromosomes 22.

**DISTRIBUTION.** On well-drained, sandy, non-calcareous open soils of the Coastal Plain (see discussion under DISTRIBUTION AND ECOLOGY) from Mobile County, Alabama to Gonzales and Goliad Counties, Texas, north-



ward to Prairie County, Arkansas, and Muskogee County, Oklahoma, United States. Map 8.

SPECIMENS EXAMINED. UNITED STATES. Without definite locality: North America, *Beyrich*, 1834 (MO); Southern States, *Torrey & Gray*, Fl. N. Amer. (GH). ALABAMA. County uncertain: Portersville, *Mohr*, 1869 (US). Mobile Co.: West Fowl River, *Mohr*, 1867 (DS, MO), 1878, 1897 (NY). MISSISSIPPI. Clarke Co.: Enterprise, *Tracy*, 1897 (NY). ARKANSAS. Without definite locality: *Nuttall* (NY); *Dr. Pitcher* (NY); central and s.w. Arkansas, *Harvey* (KSC). Arkansas Co.: Stuttgart, *Demaree 15414* (KY, NY, TENN). Ashley Co.: Lone Pine Prairie, Mist, 240 ft., *Demaree 18043* (DUKE, GH, KSC, MO, NY, TENN, UC, WVA), 19390 (MO). Bradley Co.: Jersey, *Demaree 19555* (KSC, MO, NY, OKL). Cleveland Co.: Kingsland, *Demaree 19529* (CAS, GH, MO, NY). Drew Co.: *Harvey*, July (GH); Lone Pine Prairie, *Ladelle*, *Demaree 23369* (GH, MO, NY, TENN, UC); Monticello, *Demaree 17918* (GH, OKL), 23250 (MO, NY, TENN), 17627 (GH, MO, NY, OKL, TENN), 17651 (MO). Garland Co.: Hot Springs, *Scully 384* (GH). Lonoke Co.: Grand Prairie, *Carlisle*, *Demaree 22339* (MO, PENN). Nevada Co.: Prescott, *Kellogg*, 1910 (MO). Prairie Co.: DeValls Bluff, *Demaree 22177* (GH, MO, NY). Pulaski Co.: Little Rock, *Hasse*, 1885 (NY); Camp Robinson, Little Rock, *Merrill 46* (DUKE). Sebastian Co.: Fort Smith, *Bigelow*, 1853-54 (NY, US); Massard, *Armstrong*, 1940 (TEX). Sevier Co.: *Brinkley 358* (F).

LOUISIANA. Without data, *Hale* (F, GH, NY); Red River, *Hale* (NY). Acadia Parish: Mermentau, *Degener 5122* (NY). Livingstone Parish: Port Vincent, *Rhoades*, 1931 (GH, KY). Morehouse Parish: Brodnax, *Brodnax*, 1897 (NY). Natchitoches Parish: Chopin, *E. J. Palmer 7637* (DS, MO, PH). Rapides Parish: Alexandria, *Hale* (F); Pineville, *D. & H. Correll 9933* (DUKE, GH, NY); 10 mi. north of Alexandria, *Erlanson 138* (US), 11 mi. north of Alexandria, *143a* (US). St. Tammany Parish: 1.5 mi. north of Abita Springs, *Pennell 4189* (NY, PENN, PH); Covington, *Bro. Arsène 11793* (NY, US), 11509, 11206, 11441 (US); Covington, *Bro. Anect 76, 91* (US); Mandeville to Covington, *Langlois, 1880* (F). Tangipahoa Parish: 6 mi. east and 1 mi. north of Hammond, *Nease*, 28 May, 7 June 1945 (OKL); Ponchatoula, *Featherman* (GH).

OKLAHOMA. Indian Territory, *Carleton 67* (KSC); *Butler*, 1877 (MO), 1875 (MO); on the False Washita between Fort Cobb and Fort Arbuckle, *Palmer 115*, 1868 (NY, US). Atoka Co.: Atoka, *Sheldon 67* (US); Limestone Gap, *Butler 82* (MO), 102 (PH). Bryan Co.: *Blain 299* (US). McCurtain Co.: Broken Bow, *E. J. Palmer 10483* (MO); SE T6S, R25E, SW T6S, R26E, *Little & Olmsted 337* (OKL). Muskogee Co.: Fort Gibson, *Englemann 1009* (MO); Sec 24, T13N, R18E, *Little 1253* (OKL). Pushmataha Co.: 1.75 mi. s.w. of Albion, *Waterfall 634* (GH, NY, OKL); Antlers, *E. J. Palmer 8319* (GH, MO, PH).

TEXAS. Without definite locality, *Wright* (GH); from Bexar to Austin, *Berlandier 307* (GH); from Guadalupe River to Colorado River, *Berlandier 1567* (GH). Anderson Co.: 19 mi. s.e. of Athens, *C. & A. Lundell 9610*



(SMU). Angelina Co.: Shawnee Prairie, *Boone*, 1934 (TEX). Austin Co.: 3 mi. north of Sealey, *Erlanson 57* (GH, US); 16 mi. west of San Felipe, *Lindheimer 229* (GH, MO, PH); Belleville, *Erlanson 55* (US). Bastrop Co.: Bastrop, *Tharp 1953* (TEX), *2338* (TEX, US), May 1923 (NY), *Duway* (TEX), *Strandtmann* (TEX); Bastrop-Buescher State Park, *C. & A. Lundell 8987* (SMU); Elgin, *Whitehouse*, 1929 (TEX); McDade, *Tharp 1953* (US). Bowie Co.: *Eggert*, 1898 (NY). Brazoria Co.: Alvin, *Young 7* (TEX, US); 6.5 mi. west of Alvin, *Cory 11386* (GH). Brazos Co.: *Dana 715* (US). Caldwell Co.: *McBryde*, 1931 (TEX). Cass Co.: Atlanta, *McClung*, 1926 (TEX). Cherokee Co.: Chronister, *White*, 1912 (TEX). Colorado Co.: 1 mi. west of Eagle Lake, *Warnock 46300* (TEX); Columbus, *Tharp 2339* (TEX, US). Dallas Co.: Dallas, *Reverchon 245* (MO, US), *246* (F); southeast of Dallas, *Orr 101* (SMU). Fayette Co.: *Wurzlów*, 1891 (F); Colony, *Crawford 4* (MO), *37, 43* (US), *47, 60* (F). Galveston Co.: Kemah, *Fisher*, 1915 (TEX), 1921 (US); San Leon, *Fisher*, 1915 (UC, US). Goliad Co.: Goliad, *C. Williams 19* (PH). Gonzales Co.: *McBryde*, 1931 (TEX). Gregg Co.: *York*, 1939 (GH, TEX), 1941 (GH, SMU, TEX). Hardin Co.: 7 mi. north of Silsbee, *Cory*, 1936 (GH). Harris Co.: Houston, *Lindheimer 32* (GH, MO, UC); Hockley, *Thurrow*, 1890 (F); Houston, *Eifrig*, 13 & 17 July 1926 (F); Houston, *Fisher*, 1918 (CAS, US), 1936 (CAS); Grapeland, *Tharp 81* (NY, US). Jackson Co.: near LaWard, *Drushel*, 1933 (NY). Jefferson Co.: Beaumont, *Hooks*, 1936 (TEX); Port Arthur-Beaumont, *Kilthoff*, 1927 (US). Lee Co.: *Knobloch*, 1931 (TEX). Leon Co.: 10 mi. n.e. of Marques, *Innes & Moon 942* (GH, TEX). Matagorda Co.: Citrusgrove, *F. Johnson*, 1930-1931 (TEX). Montgomery Co.: Willis, *Warm*, 25 May (MO). Nacogdoches Co.: Fern Lake, *Parks RX2326* (MO). Orange Co.: Vidor, *M. Wood*, 1931 (TEX). Polk Co.: Corrigan, *W. Taylor*, 1941 (TEX). Smith Co.: Lindale, *Reverchon 245* (MO). Tarrant Co.: Van Zandt, *Raborn & Reynolds* (TEX). Upshur Co.: 14 mi. west of Gladewater on Highway 90, *Whitehouse 16492* (SMU). Van Zandt Co.: Grand Saline, *Raborn & Reynolds*, 4 June (TEX). Walker Co.: Huntsville, *Tharp*, 1919 (TEX, US). Waller Co.: Hempstead, *Hall 119* (F, GH, MO, NY, POM, US). Victoria Co.: Victoria, *Tharp*, 1923 (TEX, US). Washington Co.: Brenham, *Whitehouse*, 1931 (TEX); *Brackett*, 1938 (TEX). Wood Co.: Golden, *McMullen*, 1927 (TEX); north of Crow, *C. & A. Lundell 9480* (SMU).

Both Pennell and Rydberg employed stature of plant, degree of pubescence and number of leaflets in maintaining *Tephrosia angustifolia* Featherman as a distinct entity. These characters are, however, quite inconstant and there is neither morphological nor geographical isolation. It is likely that the relatively few specimens then available indicated a discontinuity where none exists. The number of specimens available from Louisiana, Mississippi and Alabama is still not large or nearly adequate,



but it is sufficient to show that there is no justification for retaining *Tephrosia angustifolia* as a taxonomic entity of any sort. *Tephrosia multiflora* Featherman, described at the same time from the same locality as *T. angustifolia*, appears to have been merely a slightly larger plant.

The only significant criterion employed by Rydberg in separating his *Cracca texana* from the typical *Cracca* (*Tephrosia*) *onobrychoides* was pubescence, the leaves of the former plant being described as "glabrous or nearly so above, grayish strigose beneath," while those of the latter were "silky pilose both sides or glabrate above." The situation is not quite so simple, for the upper surface of the leaflets of *Tephrosia onobrychoides* (as defined in the present paper) may be glabrous or moderately to densely strigillose, short-strigose or hirsutulous, while the lower surface varies from sparsely strigillose or short-strigose to densely hirsutulous with spreading hairs. If degree of pubescence (including density of distribution and length of hairs) be eliminated as divisible only into arbitrary categories (as seems to be the case both here and elsewhere in the genus), the essential elements are (1) upper surfaces of leaflets glabrous versus hairy and (2) lower surfaces appressed-hairy versus spreading-hairy. These characters are usually well defined with a sharp break between the type with glabrous upper surfaces and that with trichomes evenly distributed over the surface of the leaflets. In plants in which the upper surfaces of the leaflets are hairy, the trichomes are spreading or appressed, corresponding to those on the lower surfaces. As might also be expected, plants with appressed hairs on the leaves have appressed hairs on stems and pods, while those with spreading pubescence have similar pubescence on the stems and bear minute, spreading hairs on the pods.

These two sets of leaf-pubescence characters occur in all four possible combinations within *Tephrosia onobrychoides*. Two or more types are often represented in the same collection and four are represented in *Demaree 18043*, Ashley Co., Arkansas. As is indicated in Map 8, the assembled herbarium-material clearly shows the lack of geographical segregation of any possible combination of pubescence-characters. This is further borne out by the few mass-collections which it has been possible to make. As is shown in the accompanying table and in Map 8, these show



more or less random distribution of these factors from one colony to another, although it is likely that the amount of variability differs from one part of the range to another. Even without the desirable genetic experiments and additional field-work it seems clear that the various pubescence-types merely represent forms unworthy of nomenclatural designation.<sup>1</sup>

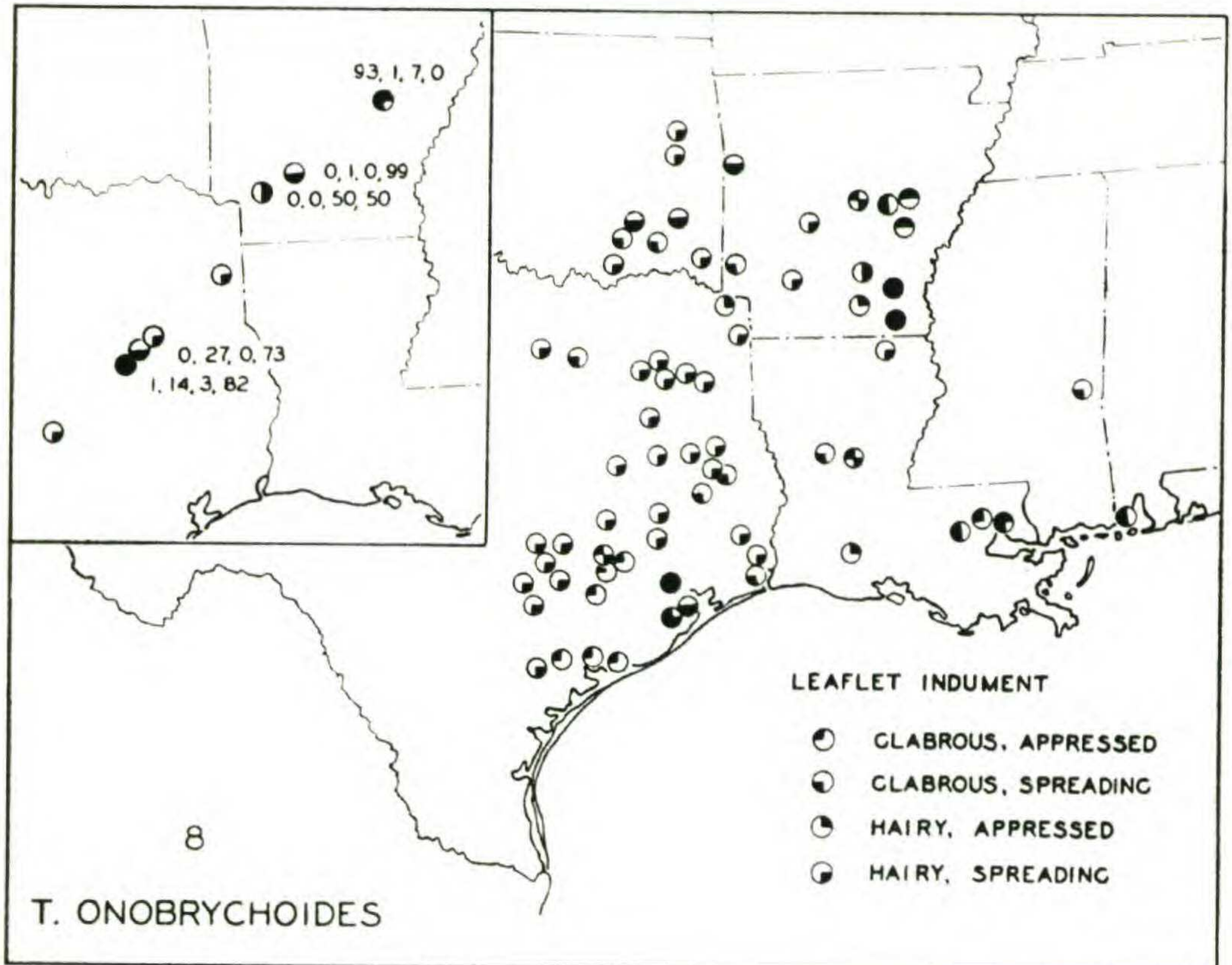
Mass-collections of *Tephrosia onobrychoides* to show variation in pubescence. Collections are arranged in sequence from northeast to southwest. (See inset, Map 8.) Figures in parentheses are per cent of total.

Locality	Leaflets glabrous above; appressed beneath	Leaflets glabrous above; spreading beneath	Leaflets pubescent above; hairs appressed	Leaflets pubescent above; hairs spreading	Total
Hazen, Prairie Co., Ark.	102 (92.7)	1 (0.9)	7 (6.3)	—	110
Gurdon, Clark Co., Ark.	—	1 (0.8)	—	127 (99.2)	128
Hope-Sheppard, Hempstead Co., Ark.	—	—	62 (49.6)	63 (50.4)	125
Jefferson, Harrison Co., Tex.	—	—	—	87 (100)	87
Neches, Anderson Co., Tex.	—	—	—	28 (100)	28
Palestine-Oakwood, Anderson Co., Tex.	—	27 (26.7)	—	74 (73.3)	101
Oakwood, Leon Co., Tex.	1 (1)	14 (14)	3 (3)	82 (82)	100
Rockdale, Milam Co., Tex.	—	—	—	43 (100)	43

<sup>1</sup> It should be noted that Map 8 shows only the distribution of the four types of pubescence as represented in herbarium-material and does not necessarily indicate population variability from one area to another. The number of specimens represented by each dot on the map varies from one to about seventeen (as from Drew Co., Ark.), the exact number depending at least in part upon the habits of the individual collectors, some of whom include portions of several plants in a single number while others tear one plant limb from limb and make several specimens of the fragments. Since many plants of *Tephrosia onobrychoides* are too large to fit an herbarium-sheet it is impossible to tell exactly how many individuals are represented. Other factors involved include the paucity of the sample, the question of the randomness of the sample represented by the herbarium-specimens and the relative scarcity of collections from Louisiana, Mississippi and Alabama. As a result of some of these factors, the lack of variability shown along the western part of the range of *Tephrosia onobrychoides* in Texas may well be more apparent than real. Although the populations in this area appear from the herbarium-data to include only plants with both surfaces of the leaflets covered with spreading hairs, the few mass-collections show that there is, in reality, much more variation present and that this may fluctuate greatly between colonies of the same region. It is, however, desirable that abundant mass-collections be made before conclusions be drawn as to the variability of populations in various parts of the range of the species.



A peculiar plant intermediate between *Tephrosia onobrychoides* and *T. florida* is represented by *Seymour & Earle 44*, Ocean Springs, Mississippi, 1 Sept. 1891 (CAS, DUKE, GH, MO). The stems of these specimens apparently were decumbent with peti-



Map 8. Distribution of *TEPHROSIA ONOBRYCHOIDES*. Localities or collections from which two or more pubescence-types are known by herbarium-specimens are indicated by superposition of two or more symbols. A solid dot, for example, indicates the occurrence of all four types at the same locality or in the same collection. For discussion see accompanying text. Inset map indicates mass-collections. Figures accompanying symbols represent the percentage of each of the four pubescence-types in the same order as in the legend.

oles longer than the lowermost leaflets; the leaves are mostly 19-foliolate; the axis of the inflorescence is somewhat flattened; the flowering nodes vary from 6 to 13; and the vexillary stamen is connate with the tube, but has a moderately distinct thickening on the upper side near the base.

## 12. *Tephrosia rhodantha* Brandeg.

*Tephrosia rhodantha* Brandeg. *Zoë* 5: 201. 1904. Cofradia (east of Culiacán), Sinaloa, Mexico, *T. S. Brandege*, 21 Oct. 1940 (UC-Type; GH, US).



*Cracca rhodantha* (Brandeg.) Rose, Contr. U. S. Nat. Herb. 12: 270. 1909.

Erect herbaceous or suffrutescent, occasionally decumbent perennial up to 1 m. tall, from a woody crown and tap-root. Stems, petioles and rachises sparsely to densely hirtellous or hirsutulous or occasionally hirsute with cinereous or rusty hairs sometimes more than 1.5 mm. long, the peduncles of the inflorescences with appressed to spreading hairs. Principal leaves 4.5–13 cm. long, spreading or ascending, the petiole 2–8(–12) mm. long, shorter than the lowermost leaflets, the rachis 3–10 cm. long; stipules linear-lanceolate to linear-subulate, 6–10 mm. long, 1.5 mm. or less wide; leaflets of the principal leaves 11–21, narrowly elliptic to linear-oblong or elliptic, the base cuneate to obtuse, the apex rounded to retuse, mucronate, (10–)15–43 mm. long, (3–)4–10(–14) mm. wide, (3–)4–6 times as long as broad, the lowermost leaflets smallest; leaflets dull, often appearing velvety, sparsely to densely hirtellous with fine hairs above, sparsely to densely hirtellous, hirsutulous, strigillose or strigose with cinereous or rusty hairs beneath; petiolules about 1 mm. long. Inflorescences terminal and axillary, the latter inserted singly and emerging obliquely from the axil, leafless, slender, lax, ascending, 4–45 cm. long, the peduncle 3–19 cm. long; flowering nodes 3–25, rather evenly scattered, the flower-buds ca. 3–5 at a node, 1–4 flowering, 1–3 fruiting. Pedicels 3–7(–9) mm. long, slender, ascending, almost filiform in flower, thickening somewhat in fruit. Dried flowers 12–15 mm. long. Calyx 3.5–6 mm. long, hirtellous and hirsutulous to hirsute with gray or rusty hairs, the lobes subulate-attenuate, the upper 1–3 mm. long, the lateral 2–4 mm. long, the lowermost 2.5–4.5 mm. long. Corolla white with a green spot at the base of the banner, becoming pink and then carmine in age, purple in dried specimens; blade of the banner suborbicular, 11–13 mm. high and broad, finely silky-hairy without, the claw 2.5 mm. long; wings obliquely obovate, 13–15 mm. long, 4–5.5 mm. broad, the claw 2–2.5 mm. long; keel 13–15 mm. long, the claw 2.5–3 mm. long. Staminal tube 11–12 mm. long; vexillary stamen free with a prominent, angular callosity on the upper side near the base. Ovary densely silky-hirtellous; ovules ca. 15. Legume straight to slightly curved upward, tapering into the persistent style-base on the upper side, 4.5–7 cm. long, 3.5–4.5 mm. wide, thinly but evenly hirtellous with antrorsely-directed, cinereous or rusty hairs, 0.2–0.4 mm. long; seeds (8–)12–15, oval-reniform in outline, 2.8–3.4 mm. long, 2–2.5 mm. broad, brown to gray, variegated with black. Somatic chromosomes 22. Flowering collections from August to February.

DISTRIBUTION. Open rocky ground and pine forests, mostly at low altitudes (0–600–1340 m.), from Sinaloa to Colima, México, Guerrero and Tabasco, in Mexico, and to British Honduras and Guatemala. Map 5.

SPECIMENS EXAMINED. MEXICO. SINALOA: Cofradia, Brandege, 1904 (GH, UC, US); Lodiago, Palmer 1619, 1891 (GH, NY, US); Capule, 200 m., Ortega 6089 (US); rocky arroyo margin, 1000 ft., Quebrada de Ilama, Sierra Tacuichamona, Gentry 5706 (MO) (for exact locality, see Gentry 1946a). COLIMA: Alzada, Orcutt 4677 (DS, F). MÉXICO:



Tejupilco, Dist. Temascaltepec. 1340 m., *Hinton 1921* (K). GUERRERO: Hill, Arcelia-Fraguas, Coyuca, Dist. Mina, *Hinton 6603* (F, GH, K, NY, US); oak forest, Alcaparosa, 560 m., Dist. Galeana, *Hinton 10845* (GH, K); hill, Vallecitos, Dist. Montes de Oca, *Hinton 11403, 11641* (GH); roadside bank on granitic soil above Río Papagayo, km. 376-377 below Tierra Colorada on road to Acapulco, *Moore & Wood 4703* (GH, UC). TABASCO: Estapilla, Tenosique, *Matuda 3517* (GH).

BRITISH HONDURAS. Monkey River, in open pine ridge, *Gentle 3632* (A, MO, NY); small shrub growing in open pine flats, All Pines, alt. 5 ft., *Schipp 685* (A, GH, MO, NY, UC).

GUATEMALA. IZABAL: Hilly pine forest near Quiriguá, 72-150 m., *Standley 72269* (F); pine ridge, vicinity of Quiriguá, *Standley 23938* (F).

*Tephrosia rhodantha* is a clearly marked species but it has been confused both with *Tephrosia multifolia* and \**T. littoralis* (= \**T. cinerea*). The combination of inflorescences inserted singly in the axils of leaves and emerging obliquely, free vexillary stamen and barbate style are quite distinctive, however. Further important points of divergence are in the slender, hirtellous pod which commonly contains 13 to 15 seeds, in contrast to the above species with 8-10 and 8 or 9-12, respectively, and in the leaflet-number which is 11-21 in *T. rhodantha* and 15-37 (predominantly 21-35) and 5-19 in the other two.

The relationships of *Tephrosia rhodantha*, in spite of its habit and axillary inflorescences, appear to be with the sympodially branched, white-flowered species with a free vexillary stamen. As in those species, the flowers of *T. rhodantha* are white, but become pink and then carmine in age. In fresh flowers (and in most herbarium-material) the vexillary stamen is quite free from the tube, but in an occasional pressed flower it is sometimes difficult to determine this condition with certainty. For this reason the species appears at several places in the artificial key.

### 13. *Tephrosia cana* Brandeg.

*Tephrosia cana* Brandeg. Proc. Calif. Acad. II. 3: 126. 1891. "High Sierras—Sierra de la Laguna and Sierra de San Francisquito," Baja California, Mexico. Rydberg chose Sierra de la Laguna as the type-locality, although no specimens from there are in the Brandege collections at UC. The Type is better taken as "Sierra de San Francisquito," *T. S. Brandege*, 20 Oct. 1890 (UC-Type; GH).

*Cracca cana* (Brandeg.) Rydb. N. Amer. Fl. 24: 176. 1923.

*Cracca californica* Rydb. N. Amer. Fl. 24: 176. 1923. Mesa Verde, Cape District, Baja California, *T. S. Brandege*, 1889 (NY-Type).



Erect or decumbent herbaceous perennial from a woody crown; roots unknown; stems 6–9 dm. long, often branching sympodially, terete or somewhat sulcate, often purplish. Stems, petioles, rachises, petiolules and axes of inflorescences sparsely to densely strigillose to short-strigose or hirsutulous and pilose with fine white hairs. Leaves 5.5–17.5 cm. long, ascending or spreading, the petioles (3–)8–58 mm. long, longer or shorter than the lowermost leaflet; stipules linear-lanceolate to linear-subulate or narrowly deltoid, 7–12 mm. long, often brown and persistent, reflexed, somewhat rigid; leaflets 7–23, linear-elliptic, oblong-elliptic or elliptic, the apex acute, obtuse or sometimes retuse with a straight or sometimes recurved mucro, 11–34(–40) mm. long, (3–)4–9(–12) mm. wide, veiny, glabrous to densely hirsutulous with ascending white hairs above, moderately to densely hirsutulous with antrorsely directed or nearly erect white hairs below, the leaflets often appearing silky or velvety white; petiolules 1–2.5 mm. long. Inflorescences opposite the leaves or terminal, leafless, usually long-peduncled, erect or ascending, 7–40 cm. long, exceeding the leaves, the flowering nodes 6–19, often congested; buds 4–5 at a node, apparently crowded because of the presence of bracteoles, 1 or 2 fruiting. Primary bracts linear-lanceolate to lanceolate, 7–9 mm. long, often deciduous or broken off; secondary bracts linear-lanceolate to lanceolate, 5 mm. or less long. Bracteoles 2, lanceolate to ovate-lanceolate, acuminate, 5–6 mm. long, borne just below the calyx or on the pedicels or near the base of the pedicels. Pedicels 5–8 mm. long, spreading-hirtellous. Dried flowers 11–15 mm. long. Calyx 6–7.5 mm. long, with the bracteoles and bracts densely hirsutulous with fine, white hairs; calyx-lobes lanceolate to ovate, long- or short-acuminate, the upper 3–4.5 mm. long, the lateral 4–6 mm. long, the lowermost 4–6 mm. long. Corolla apparently white or yellowish, becoming pink, rose or lavender in age; blade of the banner suborbicular to broadly ovate, 14–15 mm. high, 13–16 mm. broad, the claw 2.5–3 mm. long; wings 13–17 mm. long, the claw 3–3.5 mm. long; keel nearly semi-circular, 12–17 mm. long, slightly auricled, the claw 3–4 mm. long. Vexillary stamen completely free, with a prominent 2-lobed callosity on the upper side near the base. Legume with the outer half slightly curved upward, 4–7 cm. long, 4–5 mm. broad, hirtellous with ascending or erect hairs; seeds 6–11, oblong to subreniform in outline, 3.8–4.4 mm. long, 2.2–2.8 mm. broad, buff, mottled with olive green and/or black. Somatic chromosomes 22.

DISTRIBUTION. Rocky, open ground and oak forests, 0–1900 m., Cape Region, Distrito del Sur, Baja California, Mexico. Map 15.

SPECIMENS EXAMINED. MEXICO. BAJA CALIFORNIA: Dist. del Sur: Trail down the Lagunas, west side, *M. E. Jones 27203*, 24 Sept. 1930 (POM); in oak forest on dry, rocky hills north of the meadow on Sierra de la Laguna, 5000 ft., *Hammerly 389*, 14 Oct. 1941 (CAS, DS); grassy opening at edge of pine and oak forest, 1850 m., along trail to El Picacho de la Laguna, east of Todos Santos, *Carter, Alexander & Kellogg 2406*, 26 Dec. 1947 (GH, UC); Cañon San Bernardo, *Brandegge*, 13 Oct. 1893; with *Ficus*, *Lysiloma*, *Karwinskya* on crest of narrow decomposed granite ridge,



Arroyo San Bernardo, a few miles east of Rancho San Bernardo, eastern drainage of Sierra de la Victoria, west of Miraflores, 750 m., *Carter 2696*, 9 Apr. 1949 (UC); Saucito, *Brandegee*, 14 Oct. 1893 (GH, NY, POM, UC); Sierra de San Francisquito, *Brandegee 135*, 20 Oct. 1890 (UC, US-30 Oct. 1890) (GH-20 Oct. 1891, prob. this number: part of one specimen appears to be the lower portion of the Type-UC); San José del Cabo, *Brandegee*, 17 Sept. 1890 (UC); in white granite sand with *Cyrtocarpa edulis*, *Bursera microphylla*, *Jatropha* and *Fouquieria* on plateau 9.5 km. north of Santiago, ca. 300 m., *Carter 2711*, 10 Apr. 1949 (UC); granite rocks in canyon, San Bartolo, *Gentry 4366*, 20 Mar. 1939 (DS, MO, UC); rocky hillsides near beach, 11 mi. south of Todos Santos, *Whitehead 882*, 25 Mar. 1935 (DS); 17 mi. south of Todos Santos, *Shreve 7230*, 25 Mar. 1935 (DS, F, GH); Los Barriles, *Gander 9770*, 3 Nov. 1941 (CAS).

*Tephrosia cana* is distinguished by its 7-23 leaflets, congested inflorescences, rather broad calyx-lobes, densely white calyces and bracts, bracteoles on calyces or pedicels, free vexillary stamen and hirsutulous legumes. Until the spring of 1949 the species appeared to be composed of two groups of specimens, the one of collections made from September through December, the other of three collections made in March, all from the Cape Region of Baja California. The March collections are exceedingly white-hairy, have shorter petioles, slightly fewer leaflets, somewhat larger flowers, slightly broader and more shortly acuminate calyx-lobes and narrower and shorter bracteoles than does typical *Tephrosia cana*, described from an October collection. This apparent seasonal segregation suggested that these very hairy plants might represent either a seasonal phase or another entity. In April, 1949, however, Miss Annetta Carter of the University of California very kindly made several excellent collections of *Tephrosia* during a trip to Baja California. Her material dispels any possibility of seasonal phases, for *Carter 2711* shows within a single colony various combinations of characters which definitely link the two groups and *Carter 2696* is the typical form of the species. It is interesting to note that *Carter 2711* was collected at 300 m., while the very white-hairy "March" specimens are from sea-level and most of the remaining specimens (representing the typical form) are apparently from higher altitudes, up to 1850 m., suggesting altitudinal variation. *Brandegee*, 1890, from San José del Cabo, and possibly collected at a low altitude, is, however, the typical form.



The status of the plant described by Rydberg as *Cracca californica* is much more uncertain. I have seen only 3 collections, each representing a single plant and all from the Cape Region of Baja California:

Mesa Verde, *Brandeggee*, 1899 (NY-Type); granitic soil, wash margin, forested hills, San Antonio, *Gentry 4335*, 18 Mar. 1939 (DS); on rocky roadside bank with *Tecoma stans* and *Jatropha*, rolling hills, 5.3 km. n.w. of San Antonio, 300 m., *Carter 2714*, 11 Apr. 1949 (UC).

These three plants are similar to *Tephrosia cana* in habit, leaflet-number and -shape, stipules, vexillary stamen, etc. They differ strikingly, however, in the calyx, which bears only very narrow, linear bracteoles 2 mm. long (type-specimen) or lacks them completely. The calyx-lobes of the first two specimens are narrower than in *T. cana*, while on *Carter 2714* the entire calyx is very similar in shape to that of *T. Palmeri* with no evidence of bracteoles. These plants also differ from *T. cana* in their much less congested inflorescences with fewer buds at a node. *Carter 2714* definitely seems to combine characters of both *T. cana* and *T. Palmeri* and suggests that the possibility of a hybrid origin of these plants should be considered. Miss Carter reports that she found only the one large plant, however, and did not see either *T. cana* or *T. Palmeri* at that locality. Both occur in the Cape region, nevertheless, and future collectors in that area may well watch for additional plants of this type. Pending further evidence these specimens are provisionally placed here with *T. cana*.

It may be of interest to call attention to Brandeggee's original description of *Tephrosia cana* in which he noted the diadelphous androecium with the "vexillary stamen free for its whole length, even in the bud." He appears to have been the only American author to notice this conspicuous character which sets off a group of 10 related, white-flowered species.

#### 14. *Tephrosia Palmeri* S. Wats.

*Tephrosia Palmeri* S. Wats. Proc. Amer. Acad. **24**: 46. 1889. "Side of arroyo in the mountains," near Guaymas, Sonora, Mexico, *E. Palmer 246*, Oct. 1887 (GH-Type; DS, NY, US).

*Tephrosia Purisimae* Brandeg. Proc. Cal. Acad. II. **2**: 149. 1889. San Gregorio, La Purísima and Cardón Grande, Baja California, Mexico. Material from La Purísima and Cardón Grande not seen; only the specimen from San Gregorio is among Brandeggee's collections at UC. In the



absence of other material this should be the Type: *T. S. Brandegee*, 3 Feb. 1889 (UC-Type; GH, PH, US).

*Cracca Palmeri* (S. Wats.) Rose, Contr. U. S. Nat. Herb. **12**: 270. 1909.

*Tephrosia hamata* Brandeg; Rydb. N. Amer. Fl. **24**: 177. 1923, in syn. MS. name only, not published by Brandegee.

*Cracca hamata* Rydb. N. Amer. Fl. **24**: 177. 1923. San José del Cabo, Baja California, Mexico, *T. S. Brandegee*, 1 Oct. 1890 (NY-Type; DS, UC; US-fragment).

Suffrutescent caespitose perennial sometimes 7 dm. high, from a woody crown; stems many, annual, freely branching, partially sympodial, erect or decumbent, flexuous, up to 1 m. long, terete or obtusely angled. Entire plant moderately to densely strigillose or short-strigose with fine white hairs, appearing silky, canescent or hoary, frequently bluish-green. Leaves 2.6–18 cm. long, ascending, the petioles 7–40 mm. long, shorter or longer than the lowermost leaflets, the rachis 1.7–13 cm. long; stipules triangular-lanceolate or subulate, 5 mm. or less long, persistent, brown, rigid or spinescent, usually ascending; leaflets of the principal leaves 5–13 (most often 9), linear, linear-oblong or linear-oblongate, the base obtuse or acute, the apex acute, obtuse or retuse, with a straight or recurved mucro; leaflets 9–45 mm. long, (1.7)2–7 mm. wide or the terminal leaflet sometimes 50–75 mm. long, 4–6 mm. wide, moderately to densely strigillose to short-strigose on both surfaces with white hairs, usually appearing hoary or canescent, often bluish green, often somewhat conduplicate along the midrib and upwardly reflexed, the veins pale or brownish beneath; petiolules small, 1–2 mm. long. Inflorescences sometimes opposite the leaves or merely terminal, ascending or erect, 7–45 cm. long, usually greatly exceeding the leaves and leafless; flowering nodes (4–)6–16, the buds 4–5 at a node, 3–4 of these developing, 1–2 fruiting. Primary bracts subulate, rigid, persistent (although often broken in herbarium specimens), 4–5 mm. or less long; secondary bracts linear-setaceous, 4 mm. or less long. Pedicels 4–8(–10) mm. long, ascending. Dried flowers 14–18 mm. long. Calyx 5–7 mm. long, the lobes triangular, acuminate to subulate, the sinuses between usually U-shaped, the upper lobes 2.5–3.5 mm. long, the lateral 3–4 mm. long, the lowermost 3.5–4.5 mm. long. Corolla apparently white or pale yellow, becoming pink or lavender in age; blade of the banner broadly oval or ovate to suborbicular, 12–15 mm. high, ca. 14 mm. wide, finely hairy on the back, the claw 2–2.5 mm. long; wings oblong, 14–18 mm. long, with a basal auricle, the claw 3–4 mm. long; keel 13–17 mm. long, with or without a small basal auricle, the claw 3–4.5 mm. long. Staminal tube 10–14 mm. long, the vexillary stamen completely free, thickened above the base with a rounded or slightly 2-lobed callosity. Ovary densely white-silky, strigillose. Legume nearly straight, cylindrical, beaked by the upcurved style-base, 6.5–7 cm. long, 3–4 mm. in diameter, horizontal or ascending, amber-brown, densely strigillose to short-strigose with white hairs usually less than 0.8 mm. long, or occasionally hirtellous or hirsutulous with ascending hairs; seeds 6–12, oblong, 4.5–5 mm. long, 1.8–2.2 mm. wide, pale brown, mottled with black. Somatic



chromosomes 22. Flowering collections from late September and October and January to mid-May.

DISTRIBUTION. Mountains near Guaymas, Sonora, and sandy and gravelly washes in Baja California, Mexico, from about latitude 28° southward. Map 15.

SPECIMENS EXAMINED. MEXICO. SONORA: Side of arroyo, mountains, Guaymas, *Palmer 246*, 1887 (DS, GH, NY, US). BAJA CALIFORNIA: Arroyos, Santa Gertrudis, 600–700 ft., *Purpus 103* (DS, US); canyon 10 mi. north of Santa Rosalía on the Gulf Coast, *Reed G629* (DS); in wash 9 mi. from Santa Rosalía on the San Ignacio road, *Ferris 8631* (DS, NY, US); broad gravel wash just north of flying field, Santa Rosalía, *Ferris 8710* (DS, NY, US); Santa Rosalía, *Palmer 198*, 1890 (CAS, GH, US); Carmen Island, *Palmer 847*, 1890 (US); sandy washes, San Nicholas Bay, *I. M. Johnston 3709* (CAS, GH, US); San Gregorio, *Brandeggee*, 3 Feb. 1889 (GH, PH, UC, US), 1 Feb. 1889 (GH), 6 Apr. 1889 (UC); San Josef, *Rose 16567* (NY, US); Concepción Bay, *Berry 97* (CAS); among rocks around alkali flat at Coyote Cove, Concepción Bay, *Hammerly 122* (CAS, DS, GH); sandy arroyo margin among crags, Purísima, *Gentry 4221* (DS, GH, MO); mountain east of Loreto, *M. E. Jones 27195* (POM); rocks at cliff base, foothills, Rancho Primera Agua, Sierra de la Giganta, *Gentry 3718* (GH, MO, US); La Paz, *M. E. Jones 24274* (CAS, DS, MO, POM, UC); granitic bluffs near Gulf, north of Las Cruces, 32 km. east of La Paz, *Carter 2570* (UC); San José del Cabo, *Rose 16430* (NY, US), *Purpus 494* (MO, US), *Brandeggee*, 1 Oct. 1890 (DS, NY, UC, US), 29 Sept. 1890 (GH), 29 Sept. 1891 (PH); along gravelly wash banks, 15 mi. south of Rancho San Bruno, *Whitehead*, 1935 (DS); gravelly hillside 11 mi. north of Cabo San Lucas, *Whitehead 909* (DS); 5 mi. east of Cabo San Lucas, sea level, *Shreve 5265* (DS, UC); Cabo San Lucas, *Johansen 534* (DS), *Gander 9696* (CAS).

According to Rydberg, the plant he described as *Cracca hamata* differs from *Tephrosia Palmeri* in its linear-oblongate leaves with a recurved mucro. There are, however, so many intermediate leaf-shapes and conditions of the mucro that there can be hardly any doubt but that these are only two phases of the same species. In leaflet-number, calyx, fruit and pubescence the two are identical. *Tephrosia Purisimae* Brandeggee, another segregate, was separated on the basis of a supposedly different habit, pink flowers and smaller seeds. The cotypes are, however, identical with *Tephrosia Palmeri*. The specimen of the type-collection of *T. Palmeri* (*Palmer 246*, 1887) in UC, with which Brandeggee presumably compared his plants is not that species at all, but a fruiting specimen of \**T. tenella* A. Gray, a species with glabrous styles. Isotypes in GH and DS are mixtures of *T. Palmeri* and \**T. tenella*. The white or ochroleucous flowers of



*T. Palmeri* normally become pink or lavender in age, as do those of many species, so that this supposed difference is of no consequence. In *T. Palmeri*, as here understood, the leaflet-number, the silvery-white, tightly appressed pubescence, the rigid stipules and the deltoid calyx-lobes are characteristic.

15. ***Tephrosia Rugelii*** Shuttlew. ex Robinson

*Tephrosia Rugelii* Shuttlew. ex Robinson, Bot. Gaz. **28**: 197. 1899. "In pinetis, ad fl. Manate, Florida austr. occ." (Manatee River, Manatee County, Florida, United States), *Rugel 156*, June 1845 (GH-Type; NY).

*Cracca Rugelii* (Shuttlew. ex Robinson) Heller, Cat. N. Amer. Pl. ed. 2. 7. 1900.

Erect or decumbent perennial herb from a woody crown and fusiform tap-root up to 6 dm. long and 2.2 cm. wide, often with 1–several fusiform or nearly cylindrical branch-roots from its upper part; stems 1–many, up to 5.5 dm. long, monopodial with numerous axillary branches, some of which may overtop the main axis late in the season, giving the appearance of sympodial branching. Stems, petioles, rachises and petiolules strigillose or hirtellous to short-strigose or hirsutulous with golden or rusty hairs. Leaves 3.5–10 cm. long, nearly sessile or with petioles 0.2–2 cm. long; stipules oblanceolate to linear, acuminate, 8 mm. or less long, persistent, or those of the inflorescence deciduous; leaflets (3–)9–15(–17), obovate to elliptic-cuneate to narrowly cuneate, the apex obtuse, retuse or, on the terminal leaflet, sometimes obcordate, mucronate, the leaflets of a single leaf rather uniform in shape and size or the terminal slightly larger, 10–20 (–22) mm. long (including the petiolule), (3–)4–10(–14) mm. wide, yellowish green, strigillose or hirtellous above with fine cinereous hairs or rarely glabrous, strigillose or hirtellous to short-strigose or hirsutulous below with cinereous hairs, the margins with golden or rusty hairs; petiolules 1–1.5 mm. long. Inflorescences terminal or axillary, up to 15 cm. long with 1–6(–8) flowering nodes, the flowers 2–3 at a node, the lowermost and often one or more additional nodes with leaves; leaves of the inflorescence often reduced upwards, eventually to a single leaflet, a linear bract with parallel stipules, a 3-toothed bract or to a lanceolate or linear, acuminate primary bract 5–8 mm. long. Pedicels 4–12 mm. long, ascending. Dried flowers 12–18 mm. long, fresh flowers to 20 mm. Calyx 5–6 mm. long, strigillose and short-strigose or hirtellous and hirsutulous with rusty hairs, the lobes ovate-lanceolate to lanceolate, acuminate, the upper 2–3 mm. long, the lateral (2.5–)3–5 mm. long, the lowermost 3–6 mm. long, about 1.5 mm. wide. Corolla white (the back of the banner yellowish, faintly veined with red), becoming pink and then carmine with age and purple upon drying; blade of the banner nearly orbicular to subquadrate, 12–16 mm. high, 12–19 mm. broad, silky on the back, the claw 2.5–3 mm. long; wings obovate, 15–18 mm. long, auricled, the claw 2–3 mm. long; keel 12–14 mm. long, 6–7.5 mm. deep, the claw 2.5–3 mm. long. Staminal tube 8–11 mm. long, the vexillary stamen free, distinctly knobbed on the



upper side near the base. Ovary densely strigillose, silky; ovules 10–12. Legume slightly downwardly falcate or straight, 2.5–4 cm. long, 4.5–5.5 mm. wide, horizontal or ascending, hirsutulous or hirtellous with rusty, antrorsely-directed hairs; seeds 10–12, globose to subquadrate in outline and flattened laterally, 2.2–2.6 mm. in diameter, brown to gray, variegated with black. Somatic chromosomes 22. Flowering collections principally from mid-March through early June and sporadically through October.

DISTRIBUTION. Well-drained or dry, open, sandy soil in pinelands, flatwoods, pine and oak barrens, peninsular Florida from St. John, Putnam and Alachua Counties south to Broward and Lee Counties. Map 10.

SPECIMENS EXAMINED. UNITED STATES. FLORIDA: Without definite locality: *Simpson 6672* (GH, US); East Florida, *Reynolds* (US); South Florida, west coast, *Rothrock*, 1887 (PENN); Kipimee Prairie, *Mearnes*, 1901 (US). Alachua Co.: east of Gainesville, *Murrill*, Mar. 1939 (FLAS), Apr. 1939 (DUKE). Brevard Co.?: Okeechobee region, *Fredholm 5933* (GH, NY, US) (probably an error for Broward Co., since Brevard is far from Okeechobee). Broward Co.: Ft. Lauderdale, *Meredith*, 1917 (PH). Charlotte Co.: west of Punta Gorda, *Small, Mosier & DeWinkeler 10915* (FLAS). Hardee Co.: Cattle-range station near Limestone, *Kirk*, 1942 (FLAS). Highlands Co.: south of Frostproof, *Small & DeWinkeler*, 1920 (GH); Avon Park, *J. Davis*, 1933 (FLAS); Istokpoga Prairie, north of Istokpoga Creek, *Small, Mosier & DeWinkeler 10900* (DUKE, PENN, TENN, WVA). Hillsborough Co.: Sun City, *Wood & Clement 7512, 7512a* (GH); Tampa Bay, *O'Neill*, 1927 (CAS, FLAS); Tampa, *Churchill*, 1897 (GH, MO); Ballast Point, West Tampa, *Churchill*, 1923 (GH, US); Sulphur Spring, Tampa, *Churchill*, 1923 (GH); Tampa, *Garber*, 1876 (F, NY, US); Uceta, near Tampa, *Bailey & Bailey 6720* (NY); Tampa Bay, *Hulse* (NY); Sutherland, *Barnhart 2761*. Indian River Co.: near Felsmere, *Small, DeWinkeler & Mosier 11110* (NY, US). Lee Co.: west of Fort Myers, *Moldenke 958* (DUKE, PENN, NY, US); Ft. Myers, *Harshberger*, 1912 (PENN), *Hitchcock 83* (GH, KSC, MO, NY, US), *Westgate 3355, 3404* (F); Punta Rasa, *J. Standley*, 1916 (US). Manatee Co.: Manatee River, *Rugel 156* (GH, NY); Palmetto, *Kelbert & Weber*, 1928 (FLAS); Bradenton, *Wheeler*, 1924 (F); Bradenton, *Cuthbert*, 1926 (FLAS); 6 mi. east of Manatee, *Oosting 172* (DUKE). Marion Co.: 3 mi. south of Orange Springs, *West & Arnold*, 1942 (FLAS). Orange Co.: *Murrill*, 1941 (FLAS); west of Bithlo on Route 50, *Wood & Clement 7191* (GH). Osceola Co.: Campbell Station, Kissimee, *Singletory 263* (DUKE); Boyce's Place, Kissimee, *Singletory*, 1936 (DUKE). Palm Beach Co.: 3 mi. west of Delray Beach, *Fox*, 1945 (WVA). Pinellas Co.: Pinellas Point, St. Petersburg, *M. Williams*, 1926 (PH, DUKE); Dunedin, *Tracy 6833* (F, GH, NY, US). Polk Co.: *J. D. Smith*, 1880 (US); sandy soil, Conine, *Goodale 69916* (GH); Winter Haven, *McFarlin 4797* (CAS); Bartow, *Buswell*, 1919 (MIAMI). Putnam Co.: 3 mi. south of Clay Co. line on U. S. Route 17, *Wood & Clement 7170* (GH); Palatka, *C. Williamson* (PH). Sarasota Co.: Sarasota, *Vanderbilt*, 1941 (NY); Venice, *Wood & Clement 7508, 7508a* (GH); Osprey, *B. H. Smith*, 1904 (PH, DUKE).



Seminole Co.: Longwood, *Beardslee*, 1928 (UC); Oviedo, *Walker 1748* (PH, PENN). St. Johns Co.: *Reynolds* (US); *J. D. Smith*, 1879 (US); 4 mi. west of St. Augustine, *West & Arnold*, 1940 (FLAS). Volusia Co.: Ormond, *Butts*, 1943 (GH); High Banks, 2.5 mi. south of Crows Bluff (Lake Co.), *R. & L. Hindery*, 1941 (FLAS).

*Tephrosia Rugelii* is an interesting species which stands apart from its relatives of the southeastern United States in its monopodial habit. The plant may be distinguished from other Florida species by its decumbent, monopodial stems, its 9–17 relatively small, uniform leaflets which are broadest above the middle and, particularly, by the flowers borne 1–3 in the axils of leaves. It is sometimes confused with *Tephrosia spicata* but that species branches sympodially, has leafless inflorescences with as many as 20 nodes and the flowers are borne in the axils of persistent bracts. The leaflets of *T. spicata* are generally larger.

The upper surfaces of the leaves of *T. Rugelii* are usually covered with fine hairs, but plants with the upper surfaces glabrous are known from two colonies in southwestern Florida (*Wood & Clement 7512a, 7508a*) where they occur with the typical form.

#### 16. *Tephrosia spicata* (Walt.) T. & G.

*Orobus virginianus*, etc. Pluk. Mant. 142. 1700.

*Clitoria foliis pinnatis*, etc. L. Hort. Cliff. 498. 1737.

*Erebinthus* Mitch. Act. Nat. Cur. 8: app. 210. 1748.

*Cracca leguminibus retrofalcatis*, etc. L. Nov. Pl. Gen. 31–32. 1751.

*Cracca virginiana* L. Sp. Pl. 2: 752. 1753, in part. (GH-photograph of *Galega*, Sheet 5, Herb. L.)

*Galega virginiana* L. Syst. Nat. ed. 10. 2: 1172. 1759, as to plant described.

*Galega spicata* Walt. Fl. Carol. 188. 1788. (GH-photograph of Type in Herb. Walt.)

*Tephrosia spicata* (Walt.) T. & G. Fl. N. Amer. 1: 296. 1838.

*Cracca spicata* (Walt.) Kuntze, Rev. Gen. 1: 175. 1891.

*Tephrosia paucifolia* Nutt. Gen. N. Amer. Pl. 2: 119. 1818. "In Georgia and Florida, Dr. Baldwyn." (GH-ex Nuttall Coll., presented by Durand, 1866, marked "Tephrosia paucifolia, Southern States.")

*Galega paucifolia* (Nutt.) M. A. Curt. Bost. Jour. Nat. Hist. 1: 122. 1835.

*Tephrosia hispida* DC. Prod. 2: 250. 1825. "In Carolina."

*Tephrosia hispidula*  $\gamma$  T. & G. Fl. N. Amer. 1: 297. 1838. "Middle Florida, Dr. Chapman."

*Tephrosia flexuosa* Chapm. MSS.; T. & G. Fl. N. Amer. 1: 297. 1838, in syn. *T. hispidula*  $\gamma$ , not *T. flexuosa* G. Don. 1832.



*Cracca spicata flexuosa* Vail, Bull. Torr. Cl. **22**: 30. 1895, as new combination based on *T. flexuosa* Chapm., but actually the first valid publication of the name. "Florida, Chapman" (NY-Type).

*Tephrosia villosa* var. *flexuosa* (Vail) Robinson, Bot. Gaz. **28**: 200. 1899, new combination; *T. flexuosa* Chapm. and *C. spicata* var. *flexuosa* Vail cited.

*Cracca flexuosa* (Vail) Heller, Cat. N. Amer. Pl. ed. 2. 7. 1900, basonym erroneously attributed to Chapm.

*Tephrosia mollissima* Bertol. Mem. Acad. Sci. Bolog. **2**: 274. 1850. Alabama. Illustration: Bertol. Misc. Bot. **9**: pl. 3. 1851.

*Tephrosia spicata* var. *semitonsa* Fern. RHODORA **42**: 456. 1940. White sand of pine and oak woods at Round Gut, southwest of Franklin, Southampton County, Virginia, Fernald & Long 11353, 20 Sept. 1939 (GH-Type; NY, US).

Erect or decumbent perennial herb from a woody crown and a cylindrical, pale brown tap-root; stems 1-many, branching sympodially, flexuous, terete or angled, leafy from the base. Stems, petioles, rachises and petiolules strigose or hirtellous and hirsutulous to hirsute with yellowish or rusty hairs. Leaves ascending, principally 4-12 cm. long, the petioles 1-24 mm. (rarely 30 mm.) long, usually shorter than the lowermost leaflet; stipules lanceolate to linear, acute or acuminate, 8-9 mm. or less long, green, persistent; leaflets of the principal leaves 9-11-17, oblong-obovate to obovate or elliptic (or narrowly so) to oblong-elliptic, the apex very obtuse, mucronate, 11-27 mm. long, 6-13 mm. wide (occasionally 32 x 14 mm.), the terminal leaflet sometimes larger than the lateral (rarely 37 x 17 mm. or 40 x 22 mm.), the leaflets thin, finely hirtellous to hirsutulous or glabrous above, hirsutulous or short-strigose to hirsute or somewhat strigose (but the hairs not tightly appressed) beneath with yellowish or rusty hairs, the veins prominent, often reddish below. Principal inflorescences apparently opposite the leaves or terminal, 4-60 cm. long, erect or curving upward, generally exceeding the leaves, rigid, leafless, bearing flowers at 2-15 (occasionally 20) nodes which are often crowded above, the peduncle stout, terete, angled or sometimes flattened but not conspicuously so; buds 2-5 at a node, 1-3 of these developing and fruiting. Primary bracts lanceolate to linear, acute or acuminate, the lowermost 5-11 (-13) mm. long, the upper smaller, persistent, conspicuous, spreading; secondary bracts lanceolate to linear, acute or acuminate, 9 mm. or less long, that on either side of the primary bract very conspicuous, persistent. Pedicels stout, both hirtellous and hirsutulous or hirsute, 1-6(-8) mm. long, ascending. Dried flowers 12-17 mm. long. Calyx 6-7 mm. long, sparsely to densely hirtellous or hirsutulous or hirsute with cinereous and rusty hairs, the lobes somewhat variable, but usually deltoid to lanceolate (or linear), rather long-acuminate, the upper 2.5-5 mm. long, the lateral 3-5 mm. long, the lowermost 4-6 mm. long. Corolla white (the back of the banner yellowish, faintly veined with red), becoming pink and then carmine with age and purple upon drying; blade of the banner subquadrate to suborbicular, 11-15 mm. high, 11-15 mm. broad; wings 13-15 mm. long,



auricled; keel 12–13 mm. long, with or without an auricle. Staminal tube 8–10 mm. long, the vexillary stamen free, with a distinct, usually 3-lobed callosity on the upper side near the base. Ovary densely short-strigose or rarely glabrous except along the upper suture. Legume slightly curved downward, 3–5 cm. long, 4.5–6.5 mm. wide, usually ascending, hirsutulous with yellowish or rusty spreading hairs or very rarely nearly glabrous except along the upper suture; seeds 6–15, subglobose or flattened on the ends through crowding, 2.4–2.8 mm. in diameter, black to brown or gray, variegated with black. Somatic chromosomes 22. Flowering collections in January in southern Florida, late April to late June in the North and through August into September in most parts of the range.

**DISTRIBUTION.** Dry or well-drained, usually sandy soils in open woods and pinelands, Sussex County, Delaware, southward to Dade County, Florida, and westward to Holmes and Wilkinson Counties, Mississippi, and Calcasieu Parish, Louisiana, with scattered stations in eastern Tennessee and southeastern Kentucky. Map 9.

**REPRESENTATIVE SPECIMENS.** UNITED STATES. DELAWARE. Sussex Co.: *Canby*, 1863 (GH, MO); *Laurel, Commons*, 1880 (MO, NY, PH); *Georgetown, Williamson*, 1908 (PENN, PH), *Britton 6* (NY). MARYLAND. Wicomico Co.: *Salisbury, Shreve & Jones 1276* (US), *Moyer*, 1867 (US), *Wherry & Pennell 12821* (PH), *Bebb*, 1863 (F, MO). Worcester Co.: *Ferry Creek, Redmond 404* (DS); *Snow Hill* (GH).

VIRGINIA. Greenville Co.: *Quarrel's Creek below Pair's Store, Fernald & Lewis 14622* (GH). Henrico Co.: *Elko, Wherry & Pennell 12477* (MO, PH). Isle of Wight Co.: south of Zuni, *Fernald & Long 6611* (GH, NY, PENN, US). Mecklenberg Co.: 9 mi. north of Clarksville, *White*, 1945 (GH). Nansemond Co.: *Kilby, Fernald, Long & Fogg 4892* (GH, PENN). Princess Anne Co.: *Creed's, Fernald & Long 3973* (GH, PENN). Prince George Co.: 3 mi. s.e. of Petersburg, *Fernald, Long & Smart 5806* (GH, NY, PENN). Southampton Co.: *Round Gut, s.w. of Franklin, Fernald & Long 11353* (GH, NY, US); *Franklin, Heller 1028* (CAS, DS, GH, MO, NY, PENN, PH, UC).

NORTH CAROLINA. Bladen Co.: *Elizabethtown, Heller 14032* (DS). Brunswick Co.: 3.5 mi. n.e. of Bolivia, *Wood & Clement 7050* (GH). Catawba Co.: swamp north of Hickory, *Small & Heller 31* (CAS, NY, PH, US). Cherokee Co.: s.w. corner of county, *Correll 3583* (DUKE). Chowan Co.: *Edenton, L. & F. Randolph 619* (GH). Cumberland Co.: *Blomquist 3906* (DUKE). Currituck Co.: *Currituck, Bartley & Pontius 437* (NY). Dare Co.: *Roanoke Island, Schallert*, 1941 (NY, UC). Gates Co.: *Gatesville, Godfrey 5222* (GH). Granville Co.: *Little River, Camp Butner, Patten 180* (DUKE). Halifax Co.: *Weldon, Canby*, 1878 (F), *Williamson*, 1895 (PH). Harnett Co.: *Erwin, Godfrey 4627* (DUKE, GH, US). Hyde Co.: 4 mi. s.e. of Leechville, *Wiegand & Manning 1565* (GH, POM). Iredell Co.: *Statesville, Hyams*, 1879 (KSC, MO, NY, POM). Johnston Co.: 5 mi. north of Newton Grove, *Hood 147* (MO), *Rogers 192* (DUKE). Macon Co.: *Franklin, Dunham 22* (F). Moore Co.: *Southern Pines, Blankinship*, 1895 (GH). Nash Co.: *Middlesex*,



*Blomquist 6635* (DUKE). New Hanover Co.: Carolina Beach, *Godfrey 4702* (GH). Onslow Co.: Swansboro, *Wood 6483* (GH). Pamlico Co.: Arapahoe, *Oosting 33227* (DUKE). Pitt Co.: 15 mi. s.e. of Greenville, *Blomquist 11236* (DUKE). Polk Co.: Godshaw Hill, Tryon, *Peattie 970, 980* (F). Richmond Co.: 5 mi. s.w. of Rockingham, *Wood & Clement 7608* (GH). Rockingham Co.: Spray, *DeChalmot* (US). Rutherford Co.: Chimney Rock. *Biltmore Herb. 1395b* (GH, MO, NY, US). Rowan Co.: Salisbury, *Heller, 1890* (F, MO, NY, PENN, PH, UC). Sampson Co.: Clinton, *Atchison 38* (GH). Stanley Co.: Falls of the Yadkin River, *Small, 1892* (NY, PH). Transylvania Co.: Falloway, *Coughey 373* (DUKE). Wake Co.: Lake Myra, *Blomquist 3093* (DUKE). Washington Co.: Roper, *Godfrey 4286* (GH, US). Wilson Co.: *Pattern 131* (DUKE).

SOUTH CAROLINA. Aiken Co.: Aiken, *Ravenel* (NY, US). Anderson Co.: Anderson, *J. Davis, 1919* (TEX). Berkeley Co.: St. Stephens, *Martin 1752* (DUKE). Beaufort Co.: Beaufort, *Wood & Clement 7106* (GH). Charleston Co.: Charleston, *W. Palmer, 1902* (GH, US). Chesterfield Co.: 2 mi. s.w. of McBee, *Wood & Clement 7600* (GH). Darlington Co.: Hartsville, *B. Smith, 1932* (NY). Florence Co.: 6 mi. south of Florence, *Wiegand & Manning 1567* (GH). Georgetown Co.: 5.5 mi. south of Georgetown, *Godfrey & Tryon 203* (CAS, DUKE, GH, MO, NY, US). Greenville Co.: *J. D. Smith, 1881* (US). Horry Co.: 15.8 mi. north of Myrtle Beach of Route 17, *Wood & Clement 7072* (GH). Lexington Co.: 14 mi. south of Columbia, *Godfrey & Tryon 1310* (GH, NY, US). Marlboro Co.: 2 mi. south of N. Carolina boundary on U. S. Route 1, *Wood & Clement 7606* (GH). Oconee Co.: Keowee, *House 2203* (NY, US). Pickens Co.: Calhoun, *House 3498* (NY); Table Rock, *Rodgers, 1941* (DUKE). Spartanburg Co.: Campobello, *E. Walker 3485* (DUKE). Sumter Co.: Sumter, *Brownfield, 1894* (US). Williamsburg Co.: Santee River, 17 mi. south of Kingstree, *Wiegand & Manning 1568* (GH).

GEORGIA. Bartow Co.: 3 mi. south of Allatoona Dam, *Duncan 8420* (UC). Camden Co.: 2 mi. north of Kingsland, *Wood & Clement 7131* (GH). Chatham Co.: Wilmington Id., Ft. Pulaski National Monument, *Eyles 4112* (DUKE). Clarke Co.: Athens, *Perry 909* (GH, PENN, NY, US). DeKalb Co.: Stone Mt., *Eggert, 1897* (NY, TEX, UC, US). Dougherty Co.: Albany, *Pollard & Maxon 510* (NY, US). Fannin Co.: Blue Ridge, *Huger, 1900* (NY). Floyd Co.: Mt. Berry, *H. Jones, 1935* (GA). Fulton Co.: East Point, *Scheer, 1916* (GA). Gwinnett Co.: Thompsons Mills, *Allard 110* (NY, US). Houston Co.: Wellston, *Ainsworth 44530* (PH). Jasper Co.: Monticello, *Porter, 1846* (GH, F, PH). Jefferson Co.: *Hopkins, 1897* (NY). Lamar Co.: Barnesville, *Hamlin E7856* (GA). Rabun Co.: Clayton, *Reade, 1911* (DUKE). Richmond Co.: 15 mi. s.w. of Augusta, *Wood & Clement 7582* (GH). Spalding Co.: Pomona, *Riegel, 1899* (KSC). Ware Co.: *Erlanson 292* (US). Washington Co.: 25 mi. west of Sandersville, *Erlanson 333* (GA, US). Whitfield Co.: west of Dalton, *Harper 397* (NY).



FLORIDA. Broward Co.: between Ft. Lauderdale and Miami, *Small, Carter & Small*, 1911 (NY); west of Davie, *Moldenke 455*, 1930 (NY, PENN). Clay Co.: 7 mi. south of Green Cove Springs, *Wood & Clement 7166* (GH). Columbia Co.: 5 mi. east of Fort White, *West & Arnold*, 1946 (FLAS). Dade Co.: Humbugus Prairie (between Miami and Fulford), *Small, Mosier & Small 6890* (DUKE, FLAS, GH, NY, PENN, TENN, WVA, US). Dixie Co.: 10 mi. west of Shamrock, *Pasture Survey*, 1937 (FLAS). Duval Co.: Jacksonville, *Curtiss 580* (A, GH, MO, NY, PENN, PH, US), *4232* (DS, NY, UC, US), *6419* (DS, GH, MO, NY, UC, US). Escambia Co.: Pensacola, *Brinker 51* (MO, UC). Franklin Co.: Apalachicola, *Chapman* (DS, MO). Hillsborough Co.: Riverview, *Wood & Clement 7516* (GH). Lake Co.: Eustis, *Hitchcock*, 1894 (F, FLAS, KSC, MO), *Nash 754* (GH, MO, NY, POM, UC, US). Lee Co.: Ft. Myers, *J. Standley 167* (CAS, DS, GH, NY, PH, UC, US). Leon Co.: Tallahassee, *Berg*, 1895 (F, NY). Levy Co.: Raleigh, *Wood & Clement 7531* (GH). Liberty Co.: north of Roy, *Wiegand & Manning 1571* (GH). Manatee Co.: Bradenton, *Weber*, 1928 (FLAS). Marion Co.: Irvine, *Moldenke 1089a* (NY, PENN). Pasco Co.: St. Leo, *O'Neill* (FLAS). Polk Co.: Ft. Meade, *J. D. Smith*, 1880 (US); Bartow, *McFarlin 555* (TEX). Seminole Co.: Forest City, *Lewton*, 1894 (NY). Suwanee Co.: Live Oak, *Wiegand & Manning 1569* (GH, PENN). Volusia Co.: Orange City, *Hood*, 1910 (FLAS). Walton Co.: 18 mi. east of Freeport, *Erlanson 222a* (US).

KENTUCKY. McCreary Co.: high ridge above Coffee Branch, *Braun 4259* (GH, Herb. Braun). Whitley Co.: Cumberland Falls, *Braun 627* (Herb. Braun), *McFarland*, 1940 (CAS, DUKE, GA, GH, MO, NY, PH, TENN, UC, WVA). TENNESSEE. Cocke Co.: Wolf Creek, *Kearney*, 1894 (F, GH, MO, NY, US); French Broad River between Paint Rock and Del Rio, *Kearney 642* (MO, NY, US). Hamilton Co.: Missionary Ridge, Chatanooga, *Freeman & Freeman*, 1921 (US); Lookout Mt., *Vasey*, 1878 (PH). Knox Co.: 2 mi. s.w. of Univ. Tenn. Farm, *Hesler 3021* (NY, TENN). Loudon Co.: just east of Roane Co. line on U. S. Highway 70, *Sharp & Clebsch 6878* (TENN). Marion Co.: ridge west of Whitwell, *Sharp & Underwood 2586* (TENN). Meigs Co.: Decatur, *Underwood & Sharp 2297* (PENN, TENN).

ALABAMA. Baldwin Co.: Magnolia Springs, *Schallert 817* (DUKE). Blount Co.: *Mohr*, 1889 (US). Cherokee Co.: Lookout Mt., *Freeman*, 1905 (KSC). Crenshaw Co.: Dozier, *Reed 2100* (TEX). Cullman Co.: Cullman, *Sudworth*, 1891 (US). Escambia Co.: Atmore, *Blanton 195* (GH). Jackson Co.: DeSoto Falls, *Wherry*, 1933 (PENN). Jefferson Co.: Birmingham, *Hitchcock*, 1898 (F). Lee Co.: Auburn, *Earle & Baker*, 1897 (GH, KSC, MO, NY, US). Macon Co.: Notasulga, *Underwood*, 1896 (NY). Marshall Co.: 3.2 mi. north of Boaz, *Hubricht B1665* (MO). Mobile Co.: Mobile, *Mohr* (DS, US). Shelby Co.: Calera, *Everts* (NY). St. Clair Co.: Cook Spring, *Barnhart 554* (NY). Tallapoosa Co.: *Pollard & Maxon 135* (US). Tuscaloosa Co.: Tuscaloosa, *E. A. Smith*, 1893 (US).



MISSISSIPPI. Clarke Co.: Enterprise, *Tracy 3268* (part) (NY). Holmes Co.: *McGee*, 1892 (NY). Jackson Co.: Ocean Springs, *Seymour 46* (CAS, DUKE, GH, MO). Jasper Co.: Heidelberg, *Tracy 3226* (MO). Pearl River Co.: *Erlanson 178* (US). Pike Co.: Holmesville, *Wheeler* (MO). Smith Co.: Taylorville, *Tracy 8501* (GH, MO, NY, PENN, US). Wayne Co.: Waynesboro, *Pollard 1225* (GH, MO, NY, US). Wilkinson Co.: *Phares 1704* (KSC). LOUISIANA. Calcasieu Parish: Lake Charles, *Allison 59* (US). St. Tammany Parish: Covington, *Langlois*, 1895 (DS), *Bro. Arsène 11510, 11579*, etc. (US). Tangipahoa Parish: 3 mi. south of Hammond, *Erlanson 148* (US).

*Tephrosia spicata* is likely to be confused only with *T. Rugellii* (see discussion of that species) and with *T. hispidula* among the species of the southeastern United States. Although plants of *T. hispidula* with spreading pubescence have been identified by Rydberg and others as *T. spicata*, the two are quite different, particularly in the calyx, leaflet-number, -shape and -size, and inflorescence, as indicated in Key 2.

Two pubescence-forms of *Tephrosia spicata* occur, one with the upper surfaces of the leaflets completely glabrous, the other with the upper surfaces hirtellous or hirsutulous in varying degrees. A few intermediates are also found. No other differences between the two types are evident. The partially glabrous form has been designated *T. spicata* var. *semitonsa* Fernald (Walter described the hairy plant), but its importance as a geographical segregate is greatly weakened by the occurrence of both types of plants throughout most of the range of the species. Indeed, both may occur within the same colony, although the proportions vary from place to place. Few large collections are available, but three made in the summer of 1947 are interesting in this connection:

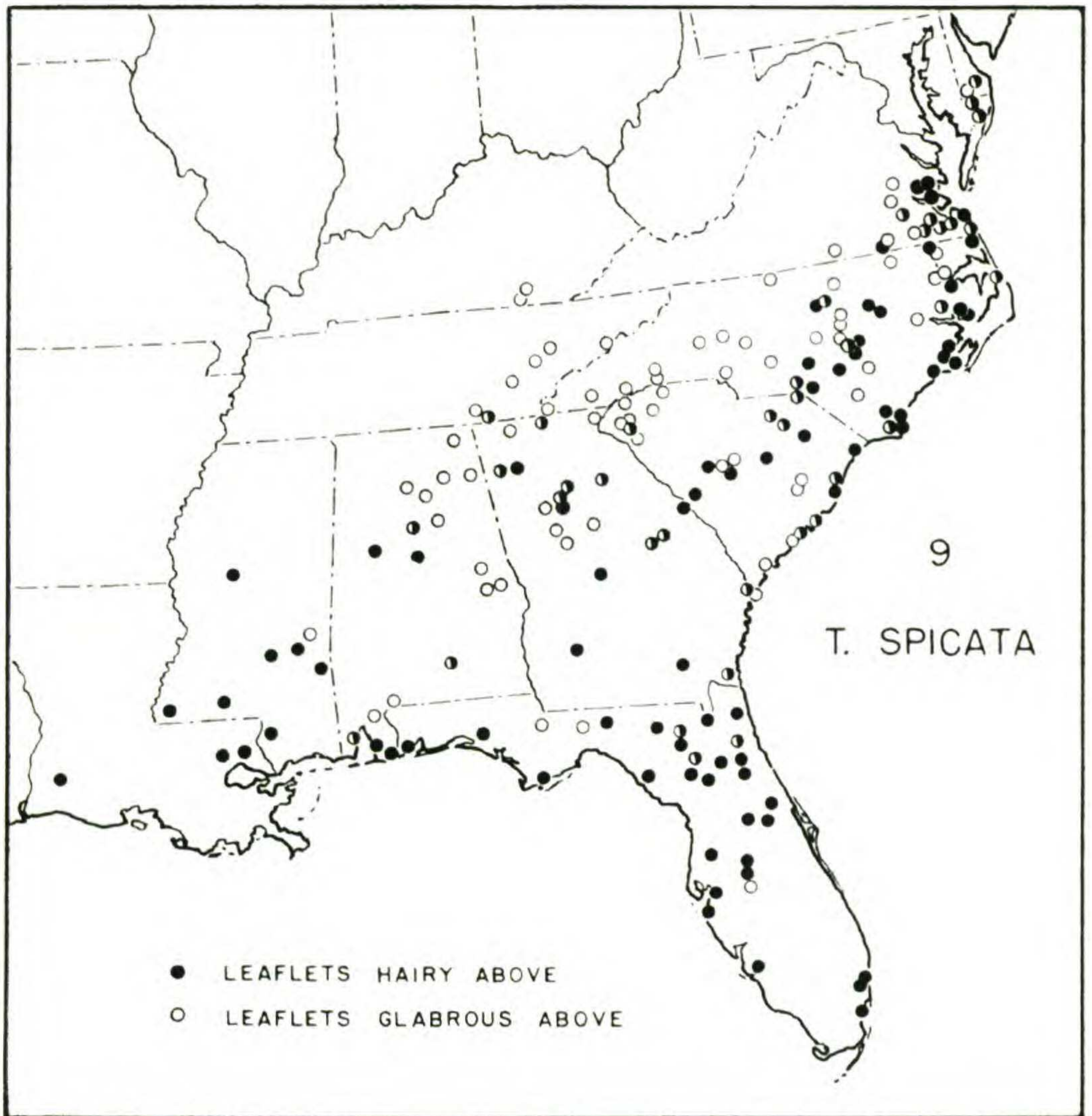
	Plants with leaflets hairy above	Plants with leaflets glabrous above
Beaufort Co., N. C.....	53 (98.2%)	1 (1.8%)
Georgetown Co., S. C.....	26 (99.3%)	2 (0.7%)
Charleston Co., S. C.....	32 (60.5%)	21 (39.5%)

Colonies consisting entirely of either type were also found. Map 9 indicates further the large number of localities or collections in which both glabrous and hairy plants occur. The slight segregation of the glabrous form in western North Carolina and eastern Tennessee and Kentucky and of hairy plants in Louisiana and



part of Florida may be more apparent than real, but this can be determined only by more careful collecting.

A peculiar, little-known form with linear leaves 1–5 cm. long and 2–6 mm. wide has been named *Cracca flexuosa* (Vail) Heller. The specimens all appear to have been stiffly erect and some give



Map. 9. Distribution of *TEPHROSIA SPICATA*. Half-filled circles indicate the occurrence of both pubescence-types in the same collection or at the same locality. See accompanying text.

the impression of having been injured. The inflorescences, which bear 1–8 flowering nodes, are usually partly leafy. The legume, calyx and coarse, over-all pubescence are, however, characteristic of *Tephrosia spicata*, of which this appears to be merely a form. The following specimens are referable to this name:



FLORIDA. *Chapman* (MO, NY, PH); probably collected by *Chapman* (F). ALABAMA. *Dr. Gates* (NY); ? Mobile, *Mohr* (F). Mobile Co.: dry, sandy pine barrens, Spring Hill, *Mohr*, Aug. 1878 (US). MISSISSIPPI. Jackson Co.: Ocean Springs, *Tracy*, 11 June 1898 (MO). Harrison Co.: Gulfport, *Lloyd & Tracy* 161, 8 Sept. 1900 (NY).

17. ***Tephrosia hispidula*** (Michx.) Pers.

*Galega hispidula* Michx. Fl. Bor. Amer. 2: 6. 1803. "In Virginia, Carolina et Georgia." (GH-photograph of Type in Herb. Mus. Paris.)

*Tephrosia hispidula* (Michx.) Pers. Syn. Pl. 2: 329. 1807.

*Cracca hispidula* (Michx.) Kuntze, Rev. Gen. 1: 175. 1891.

*Tephrosia gracilis* Nutt. Gen. N. Amer. Pl. 2: 119. 1818. "In Carolina and Georgia" (GH).

*Tephrosia elegans* Nutt. Jour. Acad. Phila. 7: 105. 1834, not Schum. ex Schum. & Thonn. 1827. "Hab. in Alabama." The description applies most nearly to *T. hispidula*, although it is not very definite. I have, however, seen no material of this species from Alabama.

Erect or decumbent perennial herb up to 5 dm. high from a slender woody crown and dark-brown, woody, fusiform tap-root, up to 3 dm. long, 1 cm. thick, which sometimes bears a few short branch roots near the upper end; stems slender, branching sympodially or partially so. Stems, petioles, rachises and axes of the inflorescences sparsely to densely strigillose to short-strigose or hirsutulous with cinereous or brownish hairs. Leaves (3-)5-10(-11) cm. long, ascending, the petioles mostly very short and the leaves nearly sessile or the petioles up to 8 (very rarely 5-20) mm. long, shorter than the lowermost leaflets; stipules linear-acuminate to linear-setaceous, 5-8 mm. or less long, persistent; leaflets of the principal leaves (9-)13-19(-23), oblong to ovate-lanceolate to narrowly elliptic (rarely elliptic or ovate), the apex acute or obtuse but not rounded, mucronate, the base rounded or merely obtuse, 7-22 mm. long, 2-7 mm. wide (very rarely 12 x 7 to 16 x 18 mm.), mostly 2-3 times as long as broad; leaflets membranous, dull, red-veined beneath, glabrous to densely strigillose or hirtellous with cinereous hairs above, sparsely to densely strigillose or hirtellous to hirsutulous with cinereous hairs beneath; petiolules 1 mm. or less long. Inflorescences opposite the leaves, terminal or axillary, slender, (1.5-)2.5-15 cm. long, erect or ascending, usually exceeding the leaves and naked or sometimes with a single leaf, bearing 1-3(-5) flowering nodes near the end; buds 2-3 at a node, one of these fruiting. Primary bracts persistent, narrowly lanceolate to linear-lanceolate, the lowermost often 3-toothed or -parted to the base, 5-7(-9) mm. long. Pedicels slender, almost filiform in flower, becoming stouter in fruit, 2-8 mm. long, ascending. Dried flowers 12-15 mm. long. Calyx 3-4 mm. long, strigillose and short-strigose or hirtellous and hirsutulous with cinereous hairs, the upper and lateral lobes deltoid, abruptly contracted near the tip, 1.5-2(-2.5) mm. long and 1.5-2.5(-3.5) mm. long, respectively, the lowermost lobe narrowly deltoid, acuminate, to lance-acuminate, 2-3(-3.5) mm. long. Corolla white (the back of the banner yellowish, faintly veined with red), becoming



pink and then carmine with age and purple upon drying; blade of the banner rounded-quadrate, 10–12 mm. high, 11–14 mm. broad, hairy on the back; wings 10–14 mm. long, auriculate; keel 10–11 mm. long, auriculate. Staminal tube 8–10 mm. long, the vexillary stamen free, sometimes distinctly thickened on the upper side near the base. Ovary densely short-strigose with stiff, coarse, cinereous or golden hairs. Legume slightly curved downward, 3–4.2 cm. long, 4.5–6 mm. wide, horizontal or ascending, sparsely to moderately hirsutulous with yellowish to cinereous hairs; seeds 10–12, Boston-baked-bean-shaped, 2.6–3.4 mm. long, gray or brown, variegated with black. Somatic chromosomes 22.

**DISTRIBUTION.** Dry to moist, or even wet, acid, sandy soils, chiefly in flat pinelands and savannahs on the outer Coastal Plain of the United States from southeastern Virginia (?) and Beaufort and Cumberland Counties, North Carolina, southward to Polk and Osceola Counties, Florida, and with a single collection from Jackson County, Florida. Map 13.

**REPRESENTATIVE SPECIMENS.** In most instances, only a single collection is cited from a county.

**UNITED STATES. VIRGINIA.** Without locality, *Torrey & Gray*, Fl. N. Amer. (GH). **NORTH CAROLINA.** Beaufort Co.: savannah, Chocowinty, *Godfrey*, 1938 (GH); savannah, 9.4 mi. south of Washington, *Wood & Clement 6992* (GH, DUKE). Bladen Co.: moist, sandy soil, east of Elizabethtown, *Heller 14056* (DS). Brunswick Co.: 3.5 mi. northeast of Bolivia, *Wood & Clement 7049* (GH). Craven Co.: pine savannah, 3.25 mi. north of Havelock, *Wood & Clement 7004* (GH). Carteret Co.: wet soil, open pineland, Silverdale, *Randolph & Randolph 933* (GH). Columbus Co.: Whiteville, *Schallert 9402* (DUKE); savannah, Old Dock, *Godfrey & Shunk 4191* (GH, US). Cumberland Co.: *Godfrey 4551* (GH, US). New Hanover Co.: savannah s.e. of Wilmington, *Coville 67* (US). Onslow Co.: pineland at Richlands, *Godfrey 4484* (GH, US). Pender Co.: Burgaw, *Blomquist 3904* (DUKE). Robeson Co.: 7 mi. s.e. of Lumberton, *Wiegand & Manning 1555* (GH).

**SOUTH CAROLINA.** Santee Canal, *Ravenel* (GH). Berkeley Co.: dry, sandy woods, 14 mi. south of Charleston, *Moldenke 1221* (DUKE, NY, PENN, US). Clarendon Co.: 2 mi. north of Manning, *Stone 122* (PH). Dorchester Co.: open pine woods, Summerville, *Hexamer & Maier*, 1855 (GH). Georgetown Co.: upland grass-sedge bog or savannah, 5 mi. south of Andrews, *Godfrey 145* (CAS, GH, MO, NY, US). Hampton Co.: sandy, peaty barrens 3 mi. n.w. of Early Branch, *Wiegand & Manning 1557* (GH, POM). Williamsburg Co.: 4 mi. north of Kingstree, *Wiegand & Manning 1556* (GH).

**GEORGIA.** *Nuttall* (GH). Bulloch Co.: dry pine barrens, *Harper 849* (GH, NY, US). Camden Co.: wet pineland, ca. 2 mi. north of Kingsland, *Wood & Clement 7133* (GH). Chatham Co.: Whitmarsh Id., Ft. Pulaski National Monument, *Eyles 4331* (DUKE). Emanuel Co.: moist pine savannah at edge of oak barren, 3 mi. north of Oak Park, *Wood & Clement 7566* (GH). Glynn Co.: just west of Brunswick, *Wood & Clement 7120*



(GH). McIntosh Co.: damp pine woods, 7 mi. north of Darien on Route 17, *Wood & Clement 7115* (GH). Screven Co.: fine sandy soil at edge of "bay", 9 mi. east of Millen, *Duncan 5544* (GA). Ware Co.: moist pine woods, 14 mi. s.w. of Waycross, *Wood & Clement 7552* (GH). Wayne Co.: sandy soil near Jessup, *Biltmore Herb. 1389f* (US).

FLORIDA. *Nash 1428, 1480, 922* (NY); *Chapman* (GH, MO, NY); *Powell, 1872* (US); *Curtiss, 1875* (US). Alachua Co.: Gainesville, *Garber* (CAS, NY, US), *Weber, 1933* (FLAS). Clay Co.: Penney Farms, *Ritchey, 1934* (FLAS). Columbia Co.: Lake City, *Hitchcock, 1898* (F, MO); moist pineland, 7 mi. north of Lake City, *Wood & Clement 7549a* (GH). Duval Co.: near Jacksonville, *Curtiss 581* (GH, MO, NY, PENN, PH, POM), *4230* (DS, NY, UC, US), *5682* (FLAS, GH, KSC, MO, NY, POM, UC, US). Jackson Co.: 4 mi. east of Marianna, *Erlanson 229* (GH). Lake Co.: vicinity of Eustis, *Nash 804* (GH, MO, NY, PH, UC, US). Lee Co.: open woods south of Ft. Myers, *Wherry, 1930* (PENN). Levy Co.: flatwoods near Lebanon, *Pasture Survey, 1937* (FLAS). Marion Co.: 1.5 mi. east of Orange Springs, *West & Arnold, 1941* (FLAS). Nassau Co.: wet pineland, just north of Gross, *Wood & Clement 7136* (GH). Orange Co.: *Meislahn 44* (US); *Baker, 1934* (MIAMI); Lake Brantley, *Lewton, 1893* (NY); wet pineland, Christmas, *Wood & Clement 7194* (GH). Osceola Co.: *Mearns, 1901* (US). Pinellas Co.: St. Petersburg, *M. Williams, 1926* (PH, DUKE). Polk Co.: Bartow, *Buswell, 1919* (MIAMI). Putnam Co.: low turkey-oak woods, Welaka, *Laessle, 1940* (FLAS). St. Johns Co.: 1.8 mi. north of Switzerland, *Murrill, 1941* (FLAS). Union Co.: 5 mi. south of Raiform, *West & Arnold, 1942* (FLAS).

*Tephrosia hispidula* is remarkable among the *Tephrosias* of the southeastern United States in inhabiting moist or even wet pine-lands, although it is not confined to such habitats and often grows in well-drained, sandy soils. All of the other southeastern species seem to require very well-drained soils. The slender, erect or decumbent plants of this species, however, may regularly be looked for in southeastern North Carolina in moist pine savannas where they often occur with *Dionaea*. In coastal Georgia I have seen the species growing with *Sarracenia* and in northern Florida on slight rises in wet pineland. Although it occurs in dry pine-lands as well, it appears to be absent from oak-barrens and is thus usually ecologically isolated from *Tephrosia florida* and always from *T. chrysophylla*. *Wood & Clement 7567*, 3 mi. north of Oak Park, Emanuel Co., Ga. (GH), consists of plants morphologically intermediate between *T. hispidula* and *T. florida*. These grew in a narrow transition zone between pine grassland and an oak-barren where the two species grew and may represent hybrids. (See DISTRIBUTION AND ECOLOGY.)



All reports of *Tephrosia hispidula* from Alabama, Mississippi and Louisiana seem to be based on small or depauperate plants of *T. florida* which sometimes resemble this species in vegetative characters. I have seen no specimens from west of Jackson County, Florida. Although the calyx of *Tephrosia hispidula* resembles that of *T. florida*, the ovary and legume are short-strigose or hirsutulous in the former and merely strigillose or hirtellous in the latter.

Pubescence of the leaflets in this species follows the four types described under *Tephrosia onobrychoides*, although plants with the upper surfaces of the leaflets glabrous and the pubescence on the lower surfaces spreading are rare. There is no geographical segregation of any of these types; two or more often occur in the same colony. Only three large collections have been made but these show more or less random distribution of pubescence-types. For example, in one from Beaufort County, North Carolina, consisting of 77 plants, the leaflets of 36 were glabrous above and strigillose beneath, while 23 were appressed-pubescent on both surfaces and 18 spreading-pubescent on both surfaces!

(To be continued)

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### CAMPANULA RENTONAE, SP. NOV.

ROBERT M. SENIOR

Planta perennis, stolonifera; caules steriles foliati, folia spathulata vel subrotundata, ca. 6 mm. longa, in petiolum 6–12 mm. longum abrupte attenuatum; caules floriferes 3–12 cm. longi, sparse foliati (1 vel plerumque 2–4), folia basalia plura, rosulatum aggregata, anguste lanceolata vel elliptica, sessilia, acuta, integra vel denticulata, breve albociliata, 1–3.5 cm. longa et 3–6 mm. lata, nervus primarius prominens. Inflorescentia flos solitarius, terminalis, in alabastro suberectus, anthesin plerumque nutans; corolla violacea vel roseo-violacea, tubus ad basin pallidior, ad 1 cm. longa et lata, lobi acuti, subpatuli, dimidio liberi; calyx ca. 4 mm. longus, subnervatus, glaber vel breve pubescens, lobi acuti, anguste triangulares, integri vel denticulati, anthesin patuli, ad 5 mm. longi; stylus tripartitus, corollam longitudine aequans vel subaequans; antherae flavae. Semina minuta, brunnea, subnitida, capsula ad apicem dehiscens.

Rootstocks thin, creeping, sending up sterile and flowering stems; sterile shoots with tiny spatulate, almost rotund, leaves about 6 mm. long, narrowed abruptly into a 6–12 mm. petiole,